

FLORA OF PANAMA

BY
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AND
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AND COLLABORATORS

PART II Fascicle 2

CYPERACEAE (Svenson)
PALMACEAE (Bailey)
CYCLANTHACEAE

ANNALS
OF THE
MISSOURI BOTANICAL GARDEN

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FLORA OF PANAMA

Part II. Fascicle 2

CYPERACEAE

By H. K. SVENSON

Grass-like or rush-like herbs, with stems (culms) usually solid and frequently leafless; leaves usually narrow, differing from grasses in the closed sheath; flowers perfect or imperfect, arranged in spikelets, one ordinarily in the axil of each scale (bract); spikelets solitary or in clusters, 1- to many-flowered, the inflorescence frequently surrounded by leaf-like bracts; perianth lacking or of bristles or scales; stamens 1-3, anthers 2-celled, the filaments elongate at maturity; style 2-cleft with the fruit (achene) flattened or lenticular (biconvex) or 3-cleft and the fruit 3-angular.

- a. Flowers, at least the pistillate ones, perfect.
- b. Spikelets with not more than 1 or 2 empty basal scales.
- c. Culms leafless; inflorescence glabrous without trace of involucre bracts..... 3. ELEOCHARIS
- cc. Culms leafy, or, if leafless, with involucre bracts.
- d. Scales of spikelets distichous.
- e. Spikelets with only 1 perfect flower..... 1. KYLLINGA
- ee. Spikelets with 2 to many perfect flowers.
- f. Inflorescence of a single much-flattened spikelet; involucre nearly obsolete..... 5. ABILGAARDIA
- ff. Inflorescence of 2 or more spikelets; involucre usually conspicuous..... 2. CYPERUS
- dd. Scales of spikelet spirally imbricated.
- e. Base of style usually persistent as a tubercle; inflorescence more or less pubescent..... 4. BULBOSTYLIS
- ee. Base of style not persistent.
- f. Flowers without inner scales.
- g. Style-base swollen; bristles lacking..... 6. FIMBRISTYLIS
- gg. Style-base not swollen; bristles frequently present..... 7. SCIRPUS
- ff. Flowers with one or more inner scales.
- g. Flowers with 3 broad stipitate scales or modified bristles..... 8. FURENA
- gg. Flowers with 1 or 2 hyaline scales; no bristles.
- h. Inner scales (2) connate..... 9. ASCOLEPIS
- hh. Inner scales (2) free and convolute..... 10. LIPOCARPHA
- bb. Spikelets with 3 or more of the lower scales empty.
- c. Style 3-cleft (sometimes 2-cleft in *Cladium*).
- d. Large plants with pistillate flower axillary..... 12. CLADIUM
- dd. Dwarf sea-side plants with pistillate flower subterminal..... 11. REMIREA
- cc. Style 2-cleft.
- d. Bristles none; spikelets compressed in a terminal involucre cluster..... 13. DICHROMENA
- dd. Bristles usually present; spikelets usually paniculate or corymbose..... 14. RYNCHOSPORA
- aa. Flowers all imperfect.

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- b. Pistillate flower enclosed in a utricle.
- c. Utricle enclosing a long uncinuate bristle..... 19. UNCINIA
- cc. Utricle enclosing only the pistil..... 20. CAREX
- bb. Pistillate flowers not enclosed in a utricle.
- c. Fertile flowers often numerous in each spikelet, lateral, each subtended by a scale.
- d. Fertile flower basal..... 15. SCLERIA
- dd. Fertile flower terminal..... 16. CALYPTROCARYA
- cc. Fertile flower, one in each spikelet, terminal.
- d. Spikelets in umbellate or paniculate spikes..... 17. HYPOLYTRUM
- dd. Spikelets crowded in a dense head..... 18. MAPANIA

1. KYLLINGA Rottb.

KYLLINGA¹ Rottb. Descr. & Icon. 12. 1773.

Cyperus (in part) Kuekenenthal, Pflanzenr. IV²⁰:1-671. 1935-1936.

Annual or perennial, usually glabrous; culms triangular, leafy below, the leaves sometimes reduced to sheaths; inflorescence terminal, of several confluent sessile heads, usually surrounded by a leafy involucre; spikelets of 3-4, 2-ranked scales, only the middle one fertile; bristles none; stamens 1-3; style bifid; achene lenticular. About 45 species, widely distributed in temperate and tropical regions, chiefly in Africa.

- a. Leaf-blades absent, the sheaths scarious and colored..... 1. K. PERUVIANA
- aa. Leaf-blades present, the sheaths not colored; involucre prominent.
- b. Scales of spikelet translucent, the keel strongly toothed.
- c. Annual..... 2. K. PUMILA
- cc. Perennial..... 3. K. BREVIFOLIA
- bb. Scales of spikelet opaque, the keel not toothed..... 4. K. ODORATA

1. KYLLINGA PERUVIANA Lam. Encycl. 3:366. 1791.

Mariscus apbyllus Vahl, Enum. 2:373. 1806.

Cyperus peruvianus F. N. Williams in Bull. Herb. Boiss. VII. 2:90. 1907; Kuekenenthal, Pflanzenr. IV²⁰:586. f. 62. 1936.

Perennial with thick creeping rhizome and coarse roots, the culms with prominent brown-striate basal sheaths; culms 1.5-4 dm. high, 1.5-2 mm. wide; bracts shorter than the single-headed inflorescence; spikelets numerous; scales ovate, obscurely veined, stramineous to brownish, the keel not toothed; stamens 3; achene narrowly obovate, 1.5 mm. long, dark lucid brown, minutely papillose.

Sandy river banks and beaches, West Indies; Costa Rica to Colombia; tropical Africa.

BOCAS DEL TORO: Laguna de Chiriquí, Hart 79; Changuinola Valley, Dunlap 520. COLÓN: Santa Isabel, Pittier 4175. CANAL ZONE: between Peluca Hydrographic Station and Quebrada Peluca, along Río Boquerón, 70 m., Steyermark & Allen 17247; France Field, Standley 28585; Isthmus of Panama, Fendler 349; Fort Sherman, Standley 31208.

2. KYLLINGA PUMILA Michx. Fl. Bor.-Amer. 1:28. 1803.

Cyperus densicaespitosus Mattf. & Kuekenenthal, Pflanzenr. IV²⁰:597. 1936.

¹ If *Kyllinga* is to be included under *Cyperus* as Kuekenenthal has recently done, then *Lipocarpus*, *Ascolepis* and *Hemicarpus* should also be included under *Cyperus*. Nothing seems to be gained by disturbing the state of these fairly well-defined elements. The genera should probably be arranged in the following order to show the natural relationships: *Cyperus*, *Kyllinga*, *Remirea*, *Ascolepis*, *Lipocarpus*, *Hemicarpus*.

Annual, caespitose, 4–40 cm. high, with leaves (2–3 mm. wide) usually shorter than the slender culms; heads 1–3, confluent, ovoid or cylindric, 4–6 mm. long, compressed; scales membranous, pale green, strongly nerved, the keel prominently toothed; stamens 1 or 2; achene elliptic, 1–1.5 mm. long, pale brown, minutely papillose.

Widely distributed, often as a weed in cultivated ground, from New York to Ohio and southward to Argentina; also in Africa.

CHIRIQUÍ: Bajo Mona and Quebrada Chiquero, alt. 1500 m., Woodson & Schery 557. PANAMÁ: Chepo, 30 m., Hunter & Allen 42; Río Tecúmen, Standley 29434. DARIÉN: Boca de Cupe, ca. 40 m., Allen 887. CANAL ZONE: Las Cruces Trail, Standley 29081; Summit, Standley 29677; Ancón Hill, Standley 25168.

3. *KYLLINGA BREVIFOLIA* Rottb. Descr. & Icon. 13. pl. 4, f. 3. 1773.

Cyperus brevifolius Hassk. Catal. Hort. Bogor. 24. 1884; Kuekenenthal, op. cit. p. 600.

Perennial with rhizomes often elongate; otherwise as in *K. pumila*, from which it is perhaps not specifically distinct. By far the most abundant species in Panama.

Georgia south to Argentina; widely distributed in tropical and temperate regions of the Old World.

BOCAS DEL TORO: Laguna de Chiriquí, Hart 82. CHIRIQUÍ: Boquete, alt. 1200–1500 m., Woodson & Schery 770; Finca Lérída to Boquete, ca. 1300–1700 m., Woodson, Allen & Seibert 1155; "New Switzerland," Allen 1379. COCLÉ: El Valle, 800–1000 m., Allen 106; between Las Margaritas and El Valle, Woodson, Allen & Seibert 1773. COLÓN: Colón, Rose 23996. CANAL ZONE: Gamboa, Pittier 4433; Balboa, Standley 30885; Gatún, Standley 27276; Juan Mina, Piper 3684.

4. *KYLLINGA ODORATA* Vahl, Enum. 2:382. 1806.

Cyperus sesquiflorus Mattf. & Kuekenenthal, op. cit. p. 591.

Perennial (?) with a short lignose fragrant rootstock, caespitose, culms 1–3 cm. high, slender; leaves shorter than the culms, 2–3 mm. wide; heads 1–3, ovoid or cylindric, 6–12 mm. long; bracts 3–4, spreading to reflexed, up to 6 cm. long; spikelets 3–3.5 mm. long; scales subacute, opaque, the keel smooth and sometimes with yellowish glands.

Wet places. Widely distributed from Georgia and Florida southward to Uruguay; also in tropical Africa and Asia. Apparently rare in Panama.

CHIRIQUÍ: Río Caldera, Killip 4532. PANAMÁ: Juan Díaz, Killip 4057; Chepo, Pittier 4465; Matías Hernández, Standley 28988.

Kyllinga pungens Vahl, a plant with strongly developed rhizomes, chiefly of tropical South America, is mentioned by Standley as occurring in Panama, but I have seen no specimens.

2. CYPERUS L.

CYPERUS L. Sp. Pl. 44. 1753; Kuekenenthal, Pflanzenr. IV²⁰:1-671. 1936.

Annuals or perennials, the culms simple, usually triangular and leafy; inflorescence involucrate in dense spikes or in clusters, capitate or on rays which are often

compound; spikelets flat or subterete, few- or many-flowered, the rachis often winged, the scales concave, 2-ranked; flowers perfect; perianth none; stamens 1-3; style 2- to 3-cleft; achene lenticular or 3-angulate. About 600 species, chiefly in tropical regions.

- a. Style 2-cleft.
 - b. Surface of achene with vertically elongated cells.
 - c. Cell margins whitened in age; scales 2 mm. long, yellow to light brown..... 1. *C. FLAVESCENS*
 - cc. Cell margins not whitened in age; scales 1 mm. long, deep brown..... 2. *C. PICEUS*
 - bb. Surface of achene with quadrate cells, frequently with embossed or papillose centers.
 - c. Spikelets 4-5 mm. wide..... 3. *C. UNIOLOIDES*
 - cc. Spikelets 1-3 mm. wide.
 - d. Spikelets greenish to yellowish-brown.
 - e. Spikelets 1-1.5 mm. wide; dwarf annuals rarely taller than 10 cm..... 5. *C. POLYSTACHYUS*
 - ee. Spikelets 2-3 mm. wide; the scale margins strongly hyaline..... 4. *C. ALBOMARGINATUS*
 - dd. Spikelets black to shining chestnut-brown; 2-3 mm. wide; the scale margins not strongly hyaline..... 6. *C. NIGER*
- aa. Style 3-cleft.
 - b. Culm terete, naked, usually over a meter high..... 15. *C. GIGANTEUS*
 - bb. Culm more or less trigonous, leafy at least below.
 - c. Decurrent scale bases (i.e. wings of the rachilla) becoming corky at maturity; the rachilla breaking into 1-fruited joints..... 7. *C. FERAX*
 - cc. Rachilla wings not becoming inflated and corky.
 - d. Inflorescence of dense, rigid, cylindric spikes.
 - e. Spikes usually sessile in a capitate inflorescence..... 12. *C. FLAVUS*
 - ee. Spikes digitately compound on long rays..... 10. *C. LIGULARIS*
 - dd. Inflorescence not of dense cylindric spikes.
 - e. Spikes loosely cylindric, the spikelets readily falling at maturity.
 - f. Scales with a long awn..... 8. *C. PANAMENSIS*
 - ff. Scales not awned.
 - g. Spikes broader at base; achene oblong-elliptic..... 13. *C. HERMAPHRODITUS*
 - gg. Spikes not broader at base; achene linear-oblong..... 9. *C. TENUIS*
 - ee. Inflorescence of globose heads or of flattened racemes.
 - f. Spikelets small (2-5 mm. long), flattened, in dense glomerulate clusters, mostly on short compound rays.
 - g. Achenes yellowish-brown, 1 mm. long..... 21. *C. LUZULAE*
 - gg. Achenes brick-red, rough, 0.7 mm. long..... 22. *C. SURINAMENSIS*
 - ff. Spikelets not glomerulate on compound rays.
 - g. Spikelets quadrangular, in loose globular heads..... 11. *C. GLOBULOSUS*
 - gg. Spikelets flattened, in umbellate or racemose clusters.
 - h. Ultimate clusters of spikelets forming simple umbels.
 - i. Umbels sessile.
 - j. Spikelets green..... 17. *C. COMPRESSUS*
 - jj. Spikelets white..... 20. *C. TENERRIMUS*
 - ii. Umbels on rays.
 - j. Rays short (up to 5 cm.).
 - k. Spikelets brown..... 24. *C. HASPAN*
 - kk. Spikelets green..... 17. *C. COMPRESSUS*
 - jj. Rays long (mostly 10-20 cm.).
 - k. Culms shorter than the rays; stamen 1..... 23. *C. SIMPLEX*
 - kk. Culms longer than the rays; stamens 2 or 3..... 25. *C. DIFFUSUS*
 - hh. Ultimate clusters of spikelets racemose (i.e. axis of the cluster more or less elongate); inflorescence with prominent rays.
 - i. Clusters narrow (4 to 5 times longer than broad); inflorescence elongate..... 14. *C. PROLIXUS*
 - ii. Clusters only slightly longer than broad; inflorescence not elongate.

- j. Spikelets purple to dark brown.....16. *C. ROTUNDUS*
 jj. Spikelets green, yellow, or yellow-brown.
 k. Spikelets dull green; rachilla not winged.....19. *C. SPHACELATUS*
 kk. Spikelets yellow to yellow-brown; achenes
 partly enclosed by the winged rachis.....18. *C. ESCULENTUS*

1. *CYPERUS FLAVESCENS* L. Sp. Pl. 46. 1753; Kuekenenthal, op. cit. p. 398; Fernald, *Rhodora* 41:529. 1939.

Cyperus Durandii Boeckl. Allg. Bot. Zeitschr. 1:185. 1895.

Annual, the culms tufted, very slender, 2-30 cm. long; leaves 1 mm. wide; bracts longer than the inflorescence; spikelets 5-20 mm. long, 2-3 mm. wide, yellowish, digitate or short-spicate; scales obtuse, closely appressed, 2 mm. long; stamens 3 or 2, the filaments persistent on the rachis; achene lenticular, obovate, 1 mm. long, black with undulate whitened incrustations at maturity.

In wet fields. Tropical and temperate regions of both hemispheres. Type from Europe.

CHIRIQUÍ: El Boquete, *Cornman* 2682. COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert* 1776; Aguadulce, near sea-level, *Pittier* 4893. PANAMÁ: between Pacora and Chepo, ca. 25 m., *Woodson, Allen & Seibert* 1637; Chepo, *Pittier* 4533; Chorrera, *Hitchcock* 8128; Las Cruces Trail, *Standley* 29083; Rio Tapia, *Standley* 28222; Chivi-Chivi, *Killip* 4083; Nuevo San Francisco, *Standley* 30750.

2. *CYPERUS PICEUS* Liebm. Dansk. Vid. Selsk. Skr. V. 2:200. 1851; Kuekenenthal, op. cit. p. 396.

Cyperus squalidus Liebm. op. cit. p. 199.

Cyperus Tonduzianus Boeckl. Allg. Bot. Zeitschr. 1:185. 1895.

Annual, the culms tufted, slender, 8-30 cm. long; leaves 0.5-1.0 mm. wide; bracts longer than the inflorescence; spikelets 6-12 mm. long, 2 mm. wide, deep brown, digitate or short-spicate; scales obtuse, closely appressed, 1.5 mm. long; stamens 3 or 2, the filaments persistent on the rachis; achene 1 mm. long, as in *C. flavescens*, but slightly shorter, more convex, and lacking the white transverse markings.

In wet places, cited by Kuekenenthal from Panama (*Seemann*). Central Mexico to Brazil and Argentina. Type from southern Mexico (Veracruz and Oaxaca).

3. *CYPERUS UNIOLOIDES* R. Br. Prodr. Fl. Nov. Holl. 216. 1810; Kuekenenthal, op. cit. p. 338.

Cyperus bromoides Link. Jahrb. 3:85. 1820.

Plants with elongate rhizomes; culms slender, 30-90 cm. high; leaves 2-4 mm. wide; bracts long and leaf-like; spikelets 10-18 mm. long, yellowish, short-spicate and on rays or in a single dense cluster; scales 4 mm. long, acute, lucid brown, closely appressed; achene obovoid, 1.5 mm. long, compressed, dull gray, coarsely reticulate.

Wet places, southern California to Argentina; tropics of Old World.

CHIRIQUÍ: El Boquete, alt. 1200-1500 m., *Woodson & Schery* 749; *Hitchcock* 8255; *Davidson* 698; *Cornman* 2695.

4. *CYPERUS ALBOMARGINATUS* Mart. & Schrad. ex Nees, in Mart. Fl. Bras. 21:9. 1842; Kuekenenthal, op. cit. p. 359.

Cyperus flavicomus Vahl, Enum. 2: 360. 1806.

Annual; culms 30–90 cm. long; leaves sparse, 5–8 mm. broad, a little shorter than the culm; involucre bracts much exceeding the inflorescence of 4–12 unequal rays; spikelets lax, 10–24 mm. long, the lower scales quickly falling; scales yellow to dull reddish-brown, 2.5 mm. long, with prominent white-hyaline margins; stamens 2 or 3; achene flattened-biconvex, broadly obovate, 2 mm. long, becoming shiny black, and densely papillose.

In wet places, Virginia to Bolivia and Paraguay; Old World tropics. Not recorded from Panama by Standley.

CANAL ZONE: Fort Kobe road, Woodson, Allen & Seibert 1427.

5. *CYPERUS POLYSTACHYUS* Rottb. Descr. & Icon. 39. 1773; Kuekenenthal, op. cit. p. 367; O'Neill, Rhodora 42:84. 1940.

Cyperus odoratus L. Sp. Pl. 46. 1753 (in part); Standley, Contrib. U. S. Nat. Herb. 27:88. 1928, and Field Mus. Bot. Ser. 8:247. 1931.

Cyperus paniculatus Rottb. Descr. & Icon. 40. 1773.

Cyperus filicinus Vahl, Enum. 2:332. 1806.

Cyperus Gatesii Torr. and C. *microdontus* Torr. Ann. Lyc. N. Y. 3:255. 1836.

Cyperus fugax Liebm. Dansk. Vid. Selskb. Skr. V. 2:196. 1851.

Cyperus texensis Steud. Syn. Cyp. 9. 1855.

Annual (or rarely perennial with a short rootstock); culms slender, tufted, up to 8 dm. high; leaves 0.5–5 mm. wide, frequently exceeding the inflorescence; bracts elongate; inflorescence 1- to 5-rayed or capitate, the rays not exceeding 5 cm.; spikelets linear to linear-lanceolate, 8–16 mm. long, 1–1.5 mm. wide; scales 1.5–2 mm. long, dull to lucid yellowish-brown; achene biconvex, narrowly elliptic, 1 mm. long, dull yellowish-brown, becoming darker with age, the surface minutely papillose.

A variable plant of tropical and temperate regions from Maine to Argentina; abundant also in the tropics of the Old World.

PANAMÁ: Taboga Island, Woodson, Allen & Seibert 1506; Bella Vista, Killip 4037.

6. *CYPERUS NIGER* Ruiz & Pavon, Fl. Peruv. 1:47. 1798; Kuekenenthal, op. cit. p. 343.

Cyperus melanostachyus HBK. Nov. Gen. & Sp. 1:207. 1816.

Cyperus diandrus var. *castaneus* S. Wats. Bot. Calif. 2:214. 1880.

Cyperus diandrus var. *capitatus* Britton, Bull. Torrey Club 13:205. 1886.

Pycnus melanostachyus C. B. Clarke, Contrib. U. S. Nat. Herb. 10:446. 1908.

Plants usually rhizomatous, frequently with interlacing culms; culms slender, erect, 10–30 cm. high; leaves sparse, 0.5–2 mm. wide, equaling or shorter than the culms; bracts long and leaf-like; inflorescence capitate, less frequently with 1–3 short rays; spikelets compressed, 4–10 mm. long, 2 mm. wide, black or more frequently castaneous; scales 1.5–2 mm. long, usually closely appressed; achene biconvex, unsymmetrically ellipsoid, 1–1.5 mm. long, deep brown and densely

papillose when mature.

Texas and New Mexico, southward in the mountains to Bolivia and Argentina. In Panama in boggy places, 1200–2000 m. altitude.

CHIRIQUÍ: "New Switzerland," alt. 1800–2000 m., Allen 1376.

CYPERUS NIGER var. *CASTANEUS* (S. Watson) Kuekenenthal, from lower levels, is much more abundant. Here seem to belong the plants named *C. lanceolatus* (*C. Olfersianus*, *C. Humboldtianus*) in various collections, insofar as I have seen them, nor does Kuekenenthal (p. 349) cite *C. lanceolatus* from Panama, a species closely related to *C. Aschenbornianus* in its reddish, somewhat glaucous achenes.

CHIRIQUÍ: Boquete, alt. 1200–1500 m., Woodson & Schery 748; Finca Lérída to Boquete, ca. 1300–1700 m., Woodson, Allen & Seibert 1157, 1134; El Boquete, Killip 4534; Cornman 2690. COCLÉ: between Las Margaritas and El Valle, Woodson, Allen & Seibert 1723. PANAMÁ: between Pacora and Chepo, Woodson, Allen & Seibert 1638 (probably *C. niger* var. *castaneus*, but too young).

7. *CYPERUS FERAX* L. C. Rich. Act. Soc. Hist. Nat. Paris 1:105. 1792; Kuekenenthal, op. cit. p. 615.

Cyperus odoratus L. Sp. Pl. 46. 1753 (in part).

Cyperus speciosus Vahl, Enum. 2:364. 1806.

Dielidium aciculare Schrad. ex Nees in Mart. Fl. Bras. 2¹:55. 1842.

Cyperus Engelmanni Steud. Syn. Cyp. 47. 1855.

Cyperus acicularis Steud. op. cit. 45. 1855.

Torulinium Hayesii C. B. Clarke, Kew Bull. Add. Ser. 8:20. 1908.

Cyperus Hayesii Standley, Jour. Washington Acad. 15:457. 1925.

Annual, the culms stout, 50–100 cm. high, with a bulbous base; leaves 5–12 mm. wide, shorter than the culm; bracts large and leaf-like; inflorescence compound, the loose heads on rays sometimes 2 dm. long; spikelets linear, subterete, 10–20 mm. long (rarely longer), yellow or brownish; scales 2–3 mm. long, striate; rachilla strongly winged, the wings becoming corky and enlarged in age, and the spikelet breaking up into single segments; achene oblong, 1.5–2.5 mm. long, frequently curved, dark brown, finely reticulate or papillose.

In moist or wet soil, often a weed in cultivated ground, at lower levels. Generally distributed in tropical and subtropical regions throughout the world. *C. Hayesii*, described from Panama (Hayes 424), is a variant with large spikes (to 4 cm. long) and many-flowered elongate spikelets up to 15 mm. long. Panama specimens, which I have seen, named *C. Ehrenbergii* Kunth (*C. flexuosus* Vahl), sometimes have the achene completely hidden in the corky rachis wings, but are otherwise identical in all details with *C. ferax*. The robust form of *C. ferax*, abundant in Panama, is shown in pl. 1, fig. 3.

BOCAS DEL TORO: Chiriquí Lagoon, von Wedel 2500; Maccaw Hill, von Wedel 5. COLÓN: Catival, Standley 30450. CANAL ZONE: Victoria Fill, near Miraflores Locks, Allen 1730; Quebrada La Palma, 70–80 m., Dodge & Allen 17355 (pathologic specimen); Fort Randolph, Standley 28750 (*Hayesii*); Balboa, Standley 25637 (*Hayesii*) 26468; Culebra, Hitchcock 8120; and many other collections. PANAMÁ: Bella Vista, Killip 12027; Standley 25368; Matías Hernández, Standley 28975; and many other collections. DARIÉN: El Real, ca. 15 m., Allen 947.

CYPERUS FERAX var. ACICULARIS (Schröd.) Kuekenh. Pflanzenr. IV²⁰:619. 1936, with remote filiform spikelets, is of rare occurrence in the tropics.

CANAL ZONE: Salamanca Hydrographic Station, ca. 80 m., Woodson, Allen & Seibert 1571.

8. CYPERUS PANAMENSIS (Clarke) Britton ex Standl. Jour. Washington Acad. Sci. 15:457. 1925; Kuekenh. op. cit. p. 498.

Mariscus panamensis C. B. Clarke, Kew Bull. Add. Ser. 8:15. 1908.

Annual, the culms usually stout, 20–50 cm. high; leaves 3–6 mm. wide; bracts large and leaf-like; spikes short-cylindric, sessile or on rays to 6 cm. long; the spikelets greenish-yellow, 3- to 8-flowered, 7–10 mm. long, obsoletely quadrangular; scales obtuse with a long recurving awn at the apex; stamens 3; achene broadly oblong, 2 mm. long, slightly curved, trigonous with concave sides, dark brown at maturity and densely papillose.

At 300 m. or less; type from Panama. Also in Colombia and Ecuador.

CANAL ZONE: Balboa, Standley 26405, 25659, 25237; Culebra, Standley 26038; Las Cruces Trail, Standley 29144, 29005; Summit, Standley 26902. PANAMÁ: near Panamá, Standley 29706; Matías Hernández, Standley 28919; Taboga Island, Standley 27952; Cornman 2536.

9. CYPERUS TENUIS Sw. Prodr. 20. 1788; Kuekenh. op. cit. p. 416.

Cyperus caracasanus Kunth, Enum. 2:86. 1837.

Mariscus flabelliformis HBK. Nov. Gen. & Sp. 1:215. 1816; C. B. Clarke, Ill. Cyp. t. 29, f. 1-2. 1909.

Cyperus lentiginosus Millsp. & Chase, Field Mus. Bot. Ser. 3:74, with pl. 1903.

Cyperus incompletus (Jacq.) Link sensu Standley, Contrib. U. S. Nat. Herb. 27:88. 1928; not *Kyllinga incompletus* Jacq.

Plants with short thick rhizomes, the slender culms 15–30 cm. high, somewhat bulbous at base; leaves mostly basal, 1.5–3 mm. wide; bracts long and leaf-like; inflorescence of 5–9 rays, the spikes loosely cylindric; spikelets greenish or yellowish, 7–10 mm. long, subterete, 3- to 8-flowered, the scales obtuse, striate; achene trigonous, linear-oblong, 1.5 mm. long, densely papillose, dull brown and slightly curved at maturity.

Abundantly distributed in Panama in rocky places and on roadsides, but not clearly distinguishable from slender forms of *C. hermaphroditus*. Central Mexico and the West Indies to southern Brazil; tropical Africa. In the accompanying plate (pl. 1, figs. 1-2) are shown two phases of this variable plant of which the dwarfer form (fig. 1) seems to be generally recognized as typical *C. tenuis*. In Killip 4156 the spikelets are 2-flowered (with only one achene developing). The form with reflexed spikelets (fig. 2) has been sometimes determined as *C. incompletus*. *M. lentiginosus* (type from Yucatan) lies between the extremes here illustrated.

CANAL ZONE: Summit, Standley 25784, 29676; Gatuncillo, Piper 5633; Balboa, Standley 25235; Río Paraiso, Standley 29922; Fort Sherman, Standley 30965; Barro Colorado Island, Standley 31449. PANAMÁ: Taboga Island, up to 300 m., Allen 135; Killip 4164; Río Tapia, Standley 28060; Maxon & Harvey 6747; Río Tecúmen, Standley 29467. DARIÉN: near mouth of Río Yapé, ca. 20 m., Allen 360.

10. *CYPERUS LIGULARIS* L. Pl. Jamaica Pugill. 3. 1759; Kuekenenthal, op. cit. p. 474. *Mariscus rufus* HBK. Nov. Gen. & Sp. 1:216. t. 67. 1816.

Plants coarse and stout, with very short or no rhizomes, often forming dense clumps, the culms as much as 1 m. high; leaves 5-12 mm. wide, thick, glaucous, usually transverse-lineolate; bracts long and leaf-like; spikes in a compound inflorescence, short and very dense, the reddish-brown spikelets 4-6 mm. long; scales coriaceous, obtuse, striate, closely appressed; achene narrowly obovate, 1.5 mm. long, sharply trigonous (the axial face usually concave), dark brown, with a lightly papillose surface.

Abundant on tropical sea-beaches and frequently inland. Generally distributed in tropical America from Alabama southward; tropical Africa, Madagascar.

BOCAS DEL TORO: Changuinola Valley, Dunlap 256. CANAL ZONE: Pedro Miguel, 15-30 m., Allen 3; Victoria Fill, near Miraflores Locks, Allen 1729; Ancón, Bro. Celestine 16; Gorgona, Hitchcock 8109; Balboa Heights, Killip 4022; Chagres, Fendler 355; Monte Lirio, Maxon 6853. PANAMÁ: Taboga Island, Woodson, Allen & Seibert 1494; Killip 4141; Bella Vista, Killip 12020; Saboga I., Pearl Islands, Miller 1797.

11. *CYPERUS GLOBULOSUS* Aubl. Pl. Guian. 1:47. 1775; Kuekenenthal, op. cit. p. 510.

Mariscus echinatus Ell. Bot. S. C. & Ga. 1:75. t. 3, f. 1. 1821.

Plants slender, with short rhizomes, the culms 15-50 cm. long; leaves 2-4 mm. wide; bracts elongate and leaf-like; spikes subglobose, crowded in a small head or on short rays, the spikelets 4-6 mm. long, crowded, subquadrangular, greenish, 3- to 6-flowered; achene narrowly obovoid, trigonous, 2 mm. long, dark olive-green with a black base, obscurely papillose.

On rocks at sea level. North Carolina to Panama and the West Indies.

CANAL ZONE: Gamboa, Standley 28312. PANAMÁ: Bella Vista, Killip 4038, 4041, 12022.

12. *CYPERUS FLAVUS* (Vahl) Nees, Linnaea 19:698. 1847.

Kyllinga cayennensis Lam. Ill. 1:149. 1791.

Mariscus flavus Vahl, Enum. 2:374. 1806.

Cyperus cayennensis (Lam.) Britton, Bull. Dept. Agr. Jamaica 5, Suppl. 1:8. 1907.

Plants with short rhizomes, the culms stout or slender, 20-70 cm. high, with thickened bases; leaves 3-7 mm. wide; involucre bracts long and leaf-like; spikes densely cylindric, 8-25 mm. long, usually sessile, yellowish; spikelets numerous, bearing 1-2 achenes; scales acute and striate; stamens 3; achenes oblong-obovate, trigonous, with concave sides, yellowish-brown, becoming punctulate when mature.

Dry savannas and sandy places. Central Mexico to Argentina; sparingly introduced in southern United States. Kuekenenthal has taken up this name instead of *C. cayennensis*, due to the uncertainty of Lamarck's description and because of Nees' affirmation that the Lamarck specimen was *C. Luzulae*. But Vahl, who knew Lamarck's plants, cited both *Kyllinga incompleta* Jacquin and K. "*cayanensis*" Lam. (1791) as synonyms of *Mariscus elatus*, which Kuekenenthal, p. 491, treats as

C. coriifolius Boeckl. Kuekenenthal, p. 532, has cited *K. incompleta* as *Cyperus flavus* var. *gigas*. *Cyperus incompletus* (Jacq.) Link, listed by Standley in 'Flora of Panama Canal Zone' as a plant with greenish spikelets, contrasted with the reddish spikelets of *C. ligularis*, is probably a variant of *C. tenuis* (cf. pl. 1, fig. 2).

BOCAS DEL TORO: Changuinola Valley, *Dunlap* 196. CANAL ZONE: Summit, *Standley* 26967; Balboa, *Standley* 26424. PANAMÁ: Taboga Island, *Woodson, Allen & Seibert* 1512; Point Chamé, *Hitchcock* 8162.

13. *CYPERUS HERMAPHRODITUS* (Jacq.) Standl. Contrib. U. S. Nat. Herb. 18:88. 1916; Kuekenenthal, op. cit. p. 487. f. 54.

Carex hermaphrodita Jacq. Coll. Bot. 4:174. 1790.

Mariscus Jacquini HBK. Nov. Gen. & Sp. 1:216. 1816.

Plants perennial, with short rhizomes, the culms mostly stout with a thickened reddish base, 15–60 cm. high; leaves 4–8 mm. wide; bracts long and leaf-like; spikes loose, capitate, or on rays to 10 cm. long; spikelets green or yellow, divaricate, quadrangular, 5–10 mm. long, 2- to 7-flowered, the scales obtuse; achene oblong-elliptic, 2 mm. long, trigonous, with the axial face concave, reddish to dull brown, papillose.

In moist soil, Mexico to Argentina. The illustrated spikelet (pl. 1, fig. 1a) is from a large specimen (*Killip* 4540) similar in appearance to Kuekenenthal's illustration. This species is questionably distinct from *C. tenuis*, at least in Panama.

CHIRIQUÍ: Finca Lérica to Boquete, ca. 1300–1700 m., *Woodson, Allen & Seibert* 1135; Potrero Muleto to summit, Volcán de Chiriquí, alt. 3500–4000 m., *Woodson & Schery* 457; Bajo Mona, mouth of Quebrada Chiquero, along Río Caldera, *Woodson, Allen & Seibert* 1019; Río Piarnasta, *Killip* 4540. CANAL ZONE: Gatún, *Bro. Heriberto* 55; Summit, *Standley* 29608.

14. *CYPERUS PROLIXUS* HBK. Nov. Gen. & Sp. 1:206. 1816; Kuekenenthal op. cit. p. 146.

Plants perennial, with a thick horizontal rhizome, the culms very stout, 1–1.5 m. high or more; leaves long, 1–2 cm. wide; bracts large and leaf-like; inflorescence large and much branched, elongate, the spikes oblong-elliptic; spikelets 15–20 mm. long, greenish or brownish, the scales lax, acute; achene linear-oblong, 2 mm. long, triquetrous, dull brown and obviously papillose.

River banks and swamps, Mexico to Argentina.

CHIRIQUÍ: Finca Lérica to Boquete, ca. 1300–1700 m., *Woodson, Allen & Seibert* 1138; Boquete, alt. 1200–1500 m., *Woodson & Schery* 733; *Hitchcock* 8287.

15. *CYPERUS GIGANTEUS* Vahl, Enum. 2:364. 1806; Kuekenenthal, op. cit. p. 49, f. 7.

Plants large and stout, the culms 1–2 m. high; leaves reduced to basal sheaths; bracts long and leaf-like, 1–2 cm. wide; inflorescence very large, the spikes elongate, lax; spikelets slender, 4–10 mm. long, 8- to 14-flowered, rachilla winged; scales obtuse, stramineous; achene oblong-ellipsoid, trigonous, 1 mm. long, the axial face concave, oblong, yellowish, densely papillose.

The plant, similar in general appearance to the papyrus of the Nile, often forms extensive and dense colonies in open swamps near the coast. Mexico to Argentina.

CANAL ZONE: Monte Lirio, *Maxon 6855*. PANAMÁ: Río Mamoni, below La Capitana, *Pittier 4577*.

16. *CYPERUS ROTUNDUS* L. Sp. Pl. 45. 1753; Kuekenenthal, op. cit. p. 107. f. 13.

Perennial, the rhizomes sometimes tuber-bearing; culms slender, 10–60 cm. high, bulbous-thickened at the base; leaves 2–6 mm. wide; bracts usually short; spikes ovate, lax, on rays to 6 cm. long; spikelets linear, 1–2 cm. long, 12- to 30-flowered, rachilla winged; scales purplish, carinate, obtuse, obscurely nerved; achene obovate-ellipsoid, bluntly trigonous, 1.5 mm. long, black, minutely papillose, maturing only infrequently.

Waste places in all tropical and subtropical regions of both hemispheres.

CANAL ZONE: Balboa Heights, *Killip 4235*; Culebra, *Pittier 6683*; Frijoles, *Pittier 6839*; Ancón, *Pittier 3956*; Colón, *Rose 23995*; Barro Colorado Island, *Kenoyer 152*; Gatún, *Standley 27327*; and many other collections. PANAMÁ: Panama City, *Pittier 6715*.

17. *CYPERUS COMPRESSUS* L. Sp. Pl. 46. 1753; Kuekenenthal, op. cit. p. 156.

Plants annual, slender, the culms tufted, 10–40 cm. high; leaves 1.5–3 mm. wide, the sheaths reddish; inflorescence of simple umbels, sessile or less commonly on short rays; spikelets 1–2.5 cm. long, 3–5 mm. wide, 12- to 30-flowered, green, rachilla not winged; achene obovoid, 1.5 mm. long, sharply trigonous, with thickened angles and concave sides, lustrous brown to black.

On sandy shores and wasteland. New York to Brazil and Bolivia; tropics of Old World.

BOCAS DEL TORO: Laguna de Chiriquí, *Hart 75*. CANAL ZONE: Gatún, *Standley 27322*; Frijoles, *Standley 31474*; Isthmus of Panama, *Fendler 352*; Gamboa, *Standley 28470*. PANAMÁ: Bella Vista, *Killip 12038, 4042*; *Standley 25370*; Las Sabanas, *Standley 25831*; Panamá, *Standley 27682*; Port Chamé, *Hitchcock 8160*.

18. *CYPERUS ESCULENTUS* L. Sp. Pl. 45. 1753; Kuekenenthal, op. cit. p. 116, f. 14. *Cyperus fulvescens* Liebm. Dansk. Vid. Selsk. Skr. V. 2:22. 1851.

Plants perennial, with long stolons ending in small tubers; the culms 10–60 cm. high; inflorescence of 5–10 lax heads on simple or compound rays; leaves 2–7 mm. wide; bracts leaf-like; the spikelets linear, 5–12 mm. long, yellowish, scales not carinate, many-nerved; achene obovate-oblong, 1.5 mm. long, trigonous, with concave sides, dull gray, minutely reticulate.

In coastal sands and waste places; temperate and tropical areas of both hemispheres. Not recorded by Standley. This species is sometimes cultivated for the tubers under the name *Chufa*.

PANAMÁ: east of Pacora, ca. 25 m., *Woodson, Allen & Seibert 755*; Point Chamé, *Hitchcock 8166*.

19. *CYPERUS SPHACELATUS* Rottb. Descr. & Icon. 26. 1773; Kuekenenthal, op. cit. p. 129.

Annual; culms slender, tufted, 10–60 cm. high; leaves 2–5 mm. wide; bracts long and leaf-like; heads few, loosely ovate, of 5–12 spikelets; spikelets 6–20 mm. long, 2 mm. wide, green or yellowish; scales acute, 2.5 mm. long, striate; achene obovoid, 1.5 mm. long, sharply trigonous, dark lucid brown, smooth.

Sandy places at or near sea level, African and New World tropics.

CANAL ZONE: Gamboa, *Pittier 4434*; Frijoles, *Killip 12177*; Cornman 2637; Balboa, *Standley 26462, 27122*, and other numbers; Culebra, *Standley 25977*. PANAMÁ: Río Chico, *Killip 4177*; Matías Hernández, *Standley 32064*; Juan Díaz, *Standley 30501*; Río Tecúmen, *Standley 26668*.

20. *CYPERUS TENERRIMUS* Presl, Rel. Haenk. 1:166. 1828; Kuekenenthal, op. cit. p. 277.

Cyperus cymbaeformis Liebm. Dansk. Vid. Selsk. Skr. V. 2:208. 1851.

Perennial with bulbous-hardened base; culms slender, 5–25 cm. high; leaves 1–2 mm. wide; bracts 4–8, very long and leaf-like; spikelets compressed, elliptic-ovate, crowded in a small dense whitened head; scales curved, obtuse; achene linear-oblong, 1 mm. long, bluntly trigonous, apiculate, dull brown, obscurely papillose.

Moist savannas. Central Mexico to Colombia.

PANAMÁ: Bella Vista, *Killip 12048*.

21. *CYPERUS LUZULAE* (L.) Retz. Obs. Bot. 4:11. 1786; Kuekenenthal, op. cit. p. 170.

Plants perennial, with short woody rhizomes, the stout culms up to 1 m. high; leaves 3–7 mm. wide; bracts 6–10, long and leaf-like; inflorescence usually simple, the spikelets densely glomerate on short rays; spikelets numerous, ovate, strongly flattened, 3–5 mm. long, 2–3 mm. wide, brownish, 6- to 10-flowered; stamen 1; scales obtuse; achene oblong, 1 mm. long, trigonous, light brown, smooth.

In moist places, at 900 m. or less. Widely distributed in tropical America from the West Indies to Paraguay.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 161*; Laguna de Chiriquí, *Hart 80*. COLÓN: Porto Bello, *Pittier 2466*. CANAL ZONE: near mouth of Río Chagres, *Allen 876*; Chivi-Chivi, *Maxon & Harvey 6590*; Barro Colorado Island, *Kenoyer 150*; Gatuncilla, *Piper 5617*; Corozal, *Piper 5310*; Summit, *Standley 25794*; Balboa, *Standley 25456*. PANAMÁ: Arraiján, ca. 15 m., *Woodson, Allen & Seibert 1343*; Sabanas, *Bro. Paul 86*; Río Tapia, *Maxon & Harvey 6653*; Matías Hernández, *Standley 28973*. DARIÉN: near mouth of Río Yapé, ca. 20 m., *Allen 359*.

22. *CYPERUS SURINAMENSIS* Rottb. Descr. & Icon. 35. pl. 6, f. 5. 1773; Kuekenenthal, op. cit. p. 174.

Perennial from short ligneous rhizomes; culms 20–60 cm. high; leaves 2–3 mm. wide; bracts long and leaf-like; inflorescence compound, the spikelets numerous, 4–11 mm. long, 2–3 mm. wide, 30- to 40-flowered, greenish or yellowish, in glomerules, the scales apiculate; achenes minute (0.7 mm. long), ellipsoid, scarcely angled, roughened, brick-red.

In swamps or wet soil, at 1,200 m. or less. Florida and Texas south to Argentina. This species has been frequently confused with *C. Luzulae*.

BOCAS DEL TORO: Chiriquí Lagoon, von Wedel 2918. CANAL ZONE: Gorgona, Hitchcock 8104; Fort Sherman, Standley 31170; Darién, Standley 31540; Frijoles, Killip 12178. PANAMÁ: Old Panama, Woodson, Allen & Seibert 1311; Chepo, 30 m., Hunter & Allen 65; Matías Hernández, Standley 31954.

23. *CYPERUS SIMPLEX* HBK. Nov. Gen. & Sp. 1:207. 1816; Kuekenenthal, op. cit. p. 225, f. 25.

Perennial from weak short rhizomes; culms 4–15 cm. long, slender; leaves long, 3–6 mm. wide; bracts very long and leaf-like; inflorescence simple, the rays mostly 10–20 cm. long; spikelets 1–3 at the end of each ray, 1–2 cm. long, 15- to 40-flowered, strongly compressed, pale; scales viscid, the apex acuminate and incurved; stamen 1; achene obovoid, truncate, obtusely trigonous, 1 mm. long, dull brown, with a whitened waxy covering, densely papillose.

Open forests and roadsides, below 100 m. altitude. Southern Mexico to Brazil and Bolivia.

CANAL ZONE: Rio Indio, 70–80 m., Dodge & Allen 17295; Barro Colorado Island, Kenoyer 142; Gamboa, Standley 28435. PANAMÁ: Arraiján, ca. 15 m., Woodson, Allen & Seibert 1344; Rio Tecúmen, Standley 29379; Rio Tapia, Standley 28209; Matías Hernández, Standley 28976; Punta Paitilla, Piper 5407.

24. *CYPERUS HASPAN* L. Sp. Pl. 45. 1753; Kuekenenthal, op. cit. p. 247.

Perennial from short slender rhizomes, or sometimes annual; culms weak; leaves mostly short and reduced to sheaths; bracts commonly 2 and shorter than the inflorescence, sometimes elongate; inflorescence usually compound, the spikelets numerous, 5–15 mm. long, 10- to 30-flowered, compressed, reddish- or greenish-brown; scales 1.5 mm. long, obtuse, minutely apiculate; achene minute (0.6 mm. long), obovoid, trigonous, yellow (frequently becoming whitened), with rough granular surface.

In swamps or wet soil, at 1,500 m. or less. Warmer regions of both hemispheres.

CHIRIQUÍ: Boquete, alt. 1200–1500 m., Woodson & Schery 745; Finca Lérída to Boquete, ca. 1300–1700 m., Woodson, Allen & Seibert 1158; Boquete, Hitchcock 8259. COCLÉ: between Las Margaritas and El Valle, Woodson, Allen & Seibert 1715, 1755; Aguadulce, Pittier 4926. CANAL ZONE: Summit, Standley 30048. PANAMÁ: east of Pacora, ca. 25 m., Woodson, Allen & Seibert 751; Las Sabanas, Bro. Heriberto 155; Chorrera, Hitchcock 8133; Chepo, Pittier 4558; and many other collections.

25. *CYPERUS DIFFUSUS* Vahl, Enum. 2:321. 1806; Kuekenenthal, op. cit. p. 208.

Cyperus toluensis HBK. Nov. Gen. & Sp. 1:206. 1816.

Cyperus cblarantibus Presl, Rel. Haenk. 1:177, t. 32, f. 1. 1828.

Plants perennial from short rootstocks; culms 30–60 cm. long, the base bulbous; leaves numerous, 4–12 mm. wide; bracts 4–10, long and leaf-like; inflorescence compound, the spikelets on long spreading rays, few or numerous, 1–2 cm. long, 10- to 24-flowered, greenish; scales truncate, with an incurving mucro; achene obovate, 1.5 mm. long, trigonous with concave sides, dark lucid brown, smooth.

In moist or dry soil, usually in forests or thickets, at 1,200 m. or less. Mexico to Argentina; warmer regions of both hemispheres.

BOCAS DEL TORO: *Carleton 188*. CHIRIQUÍ: Puerto Armuelles, alt. 0-75 m., *Woodson & Schery 818*. CANAL ZONE: near mouth of Rio Chagres, *Allen 877*; Quebrada La Palma, 70-80 m., *Dodge & Allen 17356, 17354*; between Summit and Gamboa, *Greenman & Greenman 5223*; Gorgona, *Hitchcock 8103*; Darién, *Standley 31588*; Ancón Hill, *Killip 4017*. PANAMÁ: Río La Maestra, 0-25 m., *Allen 33*; Río Tecúmen, up to 30 m., *Hunter & Allen 237*; Taboga Island, *Woodson, Allen & Seibert 1510*; Chepo, *Pittier 4497*; Cana, *Williams 980*; Río Tecúmen, *Standley 26529*; Bella Vista, *Standley 35242*. DARIÉN: Boca de Cupe, ca. 40 m., *Allen 885*.

3. ELEOCHARIS R. Br.

ELEOCHARIS R. Br. Prodr. 1:224. 1810.

Plants annual or perennial, the culms simple, terete or angulate, leafless; spikelet solitary, terminal, erect, few- to many-flowered, not involucrate, the scales spirally imbricate; perianth of 1-6 bristles, frequently wanting; stamens 1-3; style 2- to 3-cleft; achene biconvex or 3-angulate, the style base usually persistent as a tubercle. About 150 species, widely distributed.

- a. Scales firm, indurate, scarcely keeled.
 - b. Culms acutely 3-angulate above; achenes with strong horizontally elongated cells.
 - c. Achene not constricted, gradually prolonged into a cellular beak. 1. *E. MUTATA*
 - cc. Achene constricted below the summit into a neck about half the width of the achene. 2. *E. FISTULOSA*
 - bb. Culms terete.
 - c. Culms transversely septate. 3. *E. INTERSTINCTA*
 - cc. Culms not septate. 4. *E. PLICARHACHIS*
- aa. Scales thin, keeled or nerved.
 - b. Style 2-cleft.
 - c. Plants perennial, with rhizomes. 5. *E. NODULOSA*
 - cc. Plants annual, with fibrous roots. 6. *E. CARIBAEA*
 - bb. Style 3-cleft.
 - c. Culms 3-8 mm. thick. 7. *E. GENICULATA*
 - cc. Culms less than 2.5 mm. thick.
 - d. Achene cancellate. 8. *E. RETROFLEXA*
 - dd. Achene smooth or obscurely reticulate.
 - e. Plants annual.
 - f. Achenes 1 mm. long. 9. *E. MINIMA*
 - ff. Achenes 0.5-0.6 mm. long. 10. *E. NIGRESCENS*
 - ee. Plants perennial; achenes white or nearly so. 11. *E. FILICULMIS*

1. ELEOCHARIS MUTATA (L.) R. & S. Syst. 2:155. 1817.

Scirpus mutatus L. Pl. Jam. Pug. 6. 1759.

Plants with long stolons, the culms 4-10 dm. high, 3-6 mm. thick, not septate; spikelets 1.5-4 cm. long, 4-6 mm. thick, the scales obtuse, greenish; bristles longer than the achene; style 3-cleft; achene dark brown, faintly cancellate, the tubercle broader than the apex of the achene.

In wet soil. Widely distributed in tropical America and tropical Africa.

CANAL ZONE: Fort Randolph, *Standley 28632*; between Corozal and Ancón, *Pittier 6775*; salt flats, Balboa, *Standley 30892*.

2. ELEOCHARIS FISTULOSA (Poir.) Link in Spreng. Jahrb. 3:78. 1820.

Scirpus fistulosus Poir. in Lam. Encycl. 6:749. 1804.

Culms sharply triangular, 4-6 dm. high; sheaths brown, membranous, rather

loose, pointed at the summit; spikelets 1.5–3.5 cm. long, acute; scales straw-colored or gray, obtuse or somewhat acute, firm, striate; achene 2–2.4 mm. long, obovate, green or light brown, with deeply pitted quadrangular cells; bristles usually exceeding the achene.

In shallow water. Widely distributed in tropical America and in Asia and Africa.

COCLÉ: El Valle de Antón, Muenscher 12090; between Las Margaritas and El Valle, Woodson, Allen & Seibert 1720; Aguadulce, Pittier 4928. PANAMÁ: Matías Hernández, Standley 28984, 28909; Las Sabanas, Standley 25939; Río Tecúmen, Standley 26509; Chorrera, Hitchcock 8127; Chepo, Pittier, 4752, 4602, 4557; Nuevo San Francisco, Standley 30757; Juan Díaz, Killip 4090. CHIRIQUÍ: El Boquete, Hitchcock 8263; Bajo Boquete, Killip 4569.

3. *ELEOCHARIS INTERSTINCTA* (Vahl) R. & S. Syst. 2:149. 1817.

Scirpus interstinctus Vahl, Enum. 2:251. 1806.

Plants stoloniferous, the culms 4–10 dm. high, about 5 mm. thick; spikelets 2–4 cm. long, 3–5 mm. thick, obtuse, the scales very obtuse, greenish; bristles slightly longer than the achene; style 3- or 2-cleft; achene rough, the body 2 mm. long, the tubercle conic, yellow, the transverse cells prominent; bristles 6, exceeding the achene.

In wet soil. Florida and Texas, southward in the tropics.

COCLÉ: Aguadulce, Pittier 5719. CANAL ZONE: Miraflores, mouth of Río Coccolí, P. White 134; Río Chagres, 30 m., Fairchild 2047. PANAMÁ: east of Pacora, ca. 25 m., Woodson, Allen & Seibert 748; Río Tecúmen, Standley 26516.

4. *ELEOCHARIS PLICARHACHIS* (Griseb.) Svenson, Rhodora 31:158. 1929.

Scirpus plicarhachis Griseb. Cat. Pl. Cub. 239. 1866.

Plants stoloniferous, the culms 2–6 dm. high, 2–3 mm. thick; spikelets 2–2.5 cm. long, about 3 mm. thick, the scales greenish; bristles about twice as long as the achene; style 3-cleft; achene minutely reticulate, faintly striate, the tubercle lanceolate, deep brown.

Low grounds in the Canal Zone. Cuba and Mexico to Paraguay.

CANAL ZONE: Darién Station, Standley 31571; Frijoles, Svenson 433; Barro Colorado Island, Kenoyer 154. PANAMÁ: Chepo, 30 m., Hunter & Allen 87.

5. *ELEOCHARIS NODULOSA* (Roth) Schult. in R. & S. Mant. 2:87. 1824.

Scirpus nodulosus Roth, Nov. Pl. Ind. Or. 29. 1821.

Plants with rhizomes, the culms 20–70 cm. long, rather stout, 2–2.5 mm. thick; spikelets 1–2.5 cm. long, fuscous or purplish; bristles equaling the achene, the latter ovoid, greenish-brown, pitted-reticulate, the tubercle small, usually flattened.

In wet soil. Widely distributed in tropical America from Florida and Texas to Argentina.

CHIRIQUÍ: Finca Lérída to Boquete, ca. 1300–1700 m., Woodson, Allen & Seibert 1154; Boquete, Killip 4568; Hitchcock 8257. COCLÉ: El Valle, 800–1000 m., Allen 745. PANAMÁ: Chepo, 30 m., Hunter & Allen 88; east of Pacora, ca. 25 m., Woodson, Allen & Seibert 749; Matías Hernández, Standley 28838, 32046; Las Sabanas, Standley 25937;

Bro. Gervais 164; Bro. Heriberto 137; Chepo, Pittier 4744; Killip 4174; Juan Díaz, Killip 4091; Rio Tecúmen, Standley 26631; Rio Tapia, Maxon & Harvey 6648. DARIÉN: El Real, ca. 15 m., Allen 964.

6. *ELEOCHARIS CARIBAEA* (Rottb.) Blake, Rhodora 20:24. 1918.

Scirpus caribaeus Rottb. Descr. & Icon. 24. 1773.

Scirpus geniculatus L. Sp. Pl. 48. 1753 (in part).

Eleocharis capitata R. Br. Prodr. Fl. Nov. Holl. 225. 1810; not *Scirpus capitatus* L.

Culms slender, 5–30 cm. high, tufted, stiff; spikelets ovoid, obtuse, 3–5 mm. long, the scales obtuse, pale yellow, rarely brown, coriaceous, scarious-margined; bristles usually equaling the achene, the latter obovate, black, smooth and shining, the tubercle minute, depressed.

In wet soil. Generally distributed in tropical America, and in the Old World.

COLÓN: Río Indio de Fató, Pittier 4256; Colón, Lehmann 999. CANAL ZONE: Cristóbal, along French Canal, Pittier 4236; Miraflores, Pittier 2507; Fort Sherman, Standley 31138; Frijoles, Killip 12175; Balboa, Standley 30886; Darién, Standley 31505; France Field, Standley 28582. PANAMÁ: Bella Vista, Killip 12034.

7. *ELEOCHARIS GENICULATA* (L.) R. & S. Syst. 2:150. 1817.

Scirpus geniculatus L. Sp. Pl. 48. 1753 (in part), and ed. 2, 71. 1762.

Scirpus elegans HBK. Nov. Gen. & Sp. 1:226. 1816.

Rhizomes often coarse, the culms 3–10 dm. high, transversely septate, terete; spikelets 1–3 cm. long, 5–9 mm. thick, brown, the scales acutish; bristles equaling or longer than the achene, which is ellipsoid, biconvex to trigonous, granular, yellow-brown, the tubercle usually flattened, dark brown, elongate.

In wet soil, often in marshes or along stream banks; 1500 m. Generally distributed in tropical America, from central Mexico and the West Indies to Argentina.

CHIRIQUÍ: Finca Lérída to Boquete, ca. 1300–1700 m., Woodson, Allen & Seibert 1150; Boquete, alt. 1200–1500 m., Woodson & Schery 706; El Boquete, Hitchcock 8290; Davidson 646. COCLÉ: El Valle de Antón, Muenscher 12089, 12091; Aguadulce, Pittier 4964. CANAL ZONE: Corozal Road, Killip 4117; Mamei, Pittier 2253, 3794; Gorgona, Hitchcock 8108; Juan Mina, Piper 5699. PANAMÁ: east of Pacora, ca. 25 m., Woodson, Allen & Seibert 746; Chepo, Pittier 4672; Nuevo San Francisco, Standley 30760.

8. *ELEOCHARIS RETROFLEXA* (Poir.) Urban, Symb. Antill. 2:165. 1900.

Scirpus retroflexus Poir. in Lam. Encycl. 6:753. 1804.

Rhizomes filiform; culms capillary, 2–20 cm. long; spikelets 3–4 mm. long, containing 1–4 achenes, green, sometimes spotted with purple, the scales acutish; bristles equaling the achene, which is obovoid, trigonous, white, coarsely cancellate, the tubercle pyramidal.

In moist soil, the matted plants forming pure colonies in wet fields or pastures. Abundant in the American tropics, from Alabama, Cuba, and southern Mexico to Colombia and Brazil.

BOCAS DEL TORO: Chiriquí Lagoon, von Wedel 2724. CHIRIQUÍ: El Boquete, alt. 1200–1500 m., Woodson & Schery 756; Maxon 5380; Killip 4533; Davidson 572; Cornman 2683. COCLÉ: El Valle, 800–1000 m., Allen 107. COLÓN: Porto Bello, Pittier 2453. CANAL ZONE: between Peluca Hydrographic Station and Quebrada Peluca, along Río

Boqueron, 70- m., *Steyermark & Allen 17267*; Culebra, *Standley 25996*; vic. France Field, *Standley 30452*. PANAMÁ: Río Tecúmen, *Standley 26657*; Nuevo San Francisco, *Standley 30759*; Chorrera, *Killip 4334*; Río Pacora, *Killip 4211*; Panamá, *Standley 26872*; Chepo, *Pittier 4601, 4559*.

9. *ELEOCHARIS MINIMA* Kunth, Enum. 2:139. 1837.

Eleocharis Durandii Boeckl. Allg. Bot. Zeitschr. 1896:34. 1896.

Dwarf annual, the capillary culms 3-7 cm. high; spikelets 2-4 mm. long, ovate, usually many-flowered, the scales acute, dark brown; bristles inconspicuous, shorter than the achene, which is ovate, sharply trigonous, pale brown to olive, the tubercle trigonous.

Abundant in damp places in tropical America, from Texas and Alabama to Argentina.

COCLÉ: bogs between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1723* fragments, cf. *C. niger*). CANAL ZONE: Corozal, *Standley 29082*. PANAMÁ: Juan Díaz, *Standley 30515*; Matias Hernández, *Standley 28995, 32030*; Río Tecúmen, *Standley 26714*.

10. *ELEOCHARIS NIGRESCENS* (Nees) Steud. Syn. Cyp. 77. 1855.

Scirpidium nigrescens Nees in Mart. Fl. Bras. 2¹:97. 1842.

Dwarf annual, or perennial, culms 3-7 cm. high; spikelets 2-5 mm. long, ovate, many-flowered; achene semi-translucent brown to opaque white with costulate angles, minute (0.5-0.6 mm. long), the tubercle trigonous.

Damp places. South Carolina to Brazil; tropical Africa and Madagascar.

COCLÉ: Natá, ca. 50 m., *Allen 818*. PANAMÁ: vic. Juan Franco Race Track, *Standley 27816*.

11. *ELEOCHARIS FILICULMIS* Kunth, Enum. 2:144. 1837.

Scirpus sulcatus Roth, Nov. Pl. Ind. Or. 30. 1821; not Petit-Thouars, 1811.

Limnoblea calyptrata Liebm. Dansk. Vid. Selsk. Skr. V. 2:56. 1849.

Eleocharis calyptrata Steud. Syn. Cyp. 81. 1855.

Eleocharis Rothiana Boeckl. Flora 43:3. 1860.

Rhizomes short, the culms tufted, 10-30 cm. high; spikelets 4-7 mm. long, many-flowered, obtuse, fuscous or rarely purplish, the scales obtuse or emarginate; bristles shorter than the achene, which is trigonous, obovoid, smooth, the tubercle trigonous, short and broad.

Wet soil, central Mexico and Cuba to Argentina.

CHIRIQUÍ: Finca Lérída to Boquete, ca. 1300-1700 m., *Woodson, Allen & Seibert 1156*; El Boquete, *Hitchcock 8256*; *Cornman 2685, 2688*. COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1718, 1725*; Aguadulce, *Pittier 4896, 4899*; El Valle, 800-1000 m., *Allen 98*. CANAL ZONE: Las Cruces Trail, *Standley 29168*; Río Pedro Miguel, *Standley 30045*. PANAMÁ: Chepo, 30 m., *Hunter & Allen 86*; between Pacora and Chepo, 25 m., *Woodson, Allen & Seibert 1634*; Chorrera, *Hitchcock 8125*; Matias Hernández, *Pittier 6916*; Nuevo San Francisco, *Standley 30763*; Juan Díaz, *Killip 4093*; Las Cruces Trail, *Cornman 2620, 2588*.

4. *BULBOSTYLIS*¹ Kunth

¹ There is no doubt that Kunth's use of *Bulbostylis*, Enum. 2:205, came from the manuscript of Nees. As I have already mentioned in discussing *Eleocharis albibracteata* in Rhodora 31:179. 1929, Kunth had access to Nees' manuscript. And on p. 81 of Fl. Bras. (2¹. 1842) Martius definitely says:

BULBOSTYLIS Kunth, Enum. 2:205. 1837, sub *Isolepis*; Nees ex Martius, Fl. Bras. 2¹:80. 1842; not *Bulbostylis* Steven (1814) nor DC. (1836).

Stenophyllus Raf. Neogen. 4. 1825.

Oncostylis Martius, Fl. Bras. 2¹:80. 1842.

Pubescent annuals or perennials with slender culms, leafy below, the leaves narrowly linear or filiform with ciliate or pubescent sheaths; spikelets umbellate, capitate or solitary, sometimes appearing lateral on the culm, with 1 or more subtending bracts or sterile scales; scales pubescent, spirally imbricated, usually deciduous; style 3-cleft, with an enlarged base (tubercle) sometimes constricted below and usually persistent on the apex of the achene; perianth lacking; achene trigonous, rarely lenticular, with longitudinally elongate cells and frequently with a papillose-roughened surface; stamens 1-3. About 90 species, chiefly in dry sandy places, in tropics of both hemispheres.

- | | |
|--------------------------------------|-------------------|
| a. Spikelet 1 | 1. B. PARADOXA |
| aa. Spikelets few or many. | |
| b. Slender annual | 2. B. TENUIFOLIA |
| bb. Perennial. | |
| c. Achenes elongate; culms thickened | 3. B. PAPILLOSA |
| cc. Achenes obovate; culms filiform | 4. B. JUNCIFORMIS |

1. BULBOSTYLIS PARADOXA (Spreng.) Lindman, K. Sv. Vet.-Akad. Handl. Bihang 26^o:17. 1900.

Schoenus spadicus HBK. Nov. Gen. & Sp. 1:227. t. 69, f. 1. 1816; not *Eriocaulon spadicum* Lam. Encycl. 3:277. 1789; not *Schoenus spadicus* Vahl, Enum. 2:210. 1806.

Schoenus paradoxus Spreng. Syst. 1:190. 1825.

Perennial with a thickened vertical caudex clothed by persistent leaf-bases, the resulting fire-resistant structure often 6 cm. long and 3 cm. thick; culms 4-12, borne at the apex of the caudex; leaves capillary to filiform, flattened, often recurved, shorter than or equaling the culms, the sheaths densely lanate, 4-10 cm. high, thickened, striate; inflorescence a single terminal obovate spikelet 7-10 mm. long, 5 mm. wide, becoming broader at maturity by expansion of the perianth-like outer involucre bracts; scales lanceolate, rigid, long-cuspidate, lanate-fimbriate; mature achenes obovate to pyriform, obtusely trigonous, 1.5 mm. long, dark brown, undulate; tubercle dark brown, depressed-conic.

Pinelands and dry prairies. Cuba, and from Panama south to Brazil.

VERAGUAS: between Cañazas and the foot of the Cordillera Central, headwaters of Río Cañazas, 300-600 m., Allen 151. COCLÉ: Penonomé, Williams 304. CANAL ZONE: R. Azote Caballo, 66-70 m., Dodge, Steyermark & Allen 16851.

"Kunth. En. II. 205 (cum *Isolepis* tanquam Sect. III.) *Bulbostylis* N. ab E. MSS.—*Isolepis* spec. N. ab E. . . —*Scirpis* spec. Linn. et Auctt. (Nomen genericum *Bulbostylis* a Neesio inditum et in generum dispositione (supra 72) positum mutavi in *Oncostylis*, quod *Bulbostylis* jam a De Candollio (*Prodr.* V. 138) usurpatum sit. Mart.)" [The generic name *Bulbostylis* given by Nees and inserted in the arrangement of genera (p. 72) I have changed into *Oncostylis* because *Bulbostylis* has already been used by De Candolle. (Martius)]. *Bulbostylis* Kunth, published only as a section of *Isolepis* and not as a genus, was conserved by the Committee on Nomenclature (cf. *Rhodora* 40:392. 1938). Since Kunth's name has been conserved as a genus it seems that further argument about the exact place of publication is unnecessary.

2. *BULBOSTYLIS TENUIFOLIA* (Rudge) Macbride, Field Mus. Bot. Ser. 11:5. 1931. *Scirpus tenuifolius* Rudge, Pl. Guian. 18:t. 22. 1805.

Annual; culms capillary, 0.5–2 dm. high, glabrous; leaves capillary, shorter than culms, usually glabrous; spikelets narrowly ovate, 3–6 mm. long, dark brown; achene trigonous, obovate, 0.6–0.8 mm. long, usually finely papillose, grayish-brown, often with concave sides.

Northern South America; of scattered distribution in West Indies, Mexico, and Central America.

CHIRIQUÍ: El Boquete, Killip 4507. CANAL ZONE: Ancón Hill, Standley 26353; Cornman 2520. PANAMÁ: Las Sabanas, Standley 25907; Nuevo San Francisco, Standley 30712.

3. *BULBOSTYLIS PAPILLOSA* Kuekenenthal in Fedde, Rep. Sp. Nov. 23:198. 1926.

Culms bulbous-thickened at base, 5–10 dm. high, glabrous, generally inflated; leaves much shorter than culms, the sheaths cinnamon-brown; inflorescence a congested compound umbel; spikelets 7–12 mm. long, lucid reddish-brown; achene brown, oblong, 1 mm. long, with a densely papillose surface.

West Indies; Mexico to Bolivia and Brazil.

CHIRIQUÍ: El Boquete foothills, 1000–1300 m., Hitchcock 8181, 8323; Cornman 2677. CANAL ZONE: Ancón Hill, Killip 4121, 12089; Standley 25196, 26350. PANAMÁ: Taboga Island, Woodson, Allen & Seibert 1461; Standley 28051.

4. *BULBOSTYLIS JUNCIFORMIS* (HBK.) Lindman, K. Sv. Vet.-Akad. Handl. Bihang 26^o:19. 1900.

Isolepis junciformis HBK. Nov. Gen. & Sp. 1:222. 1816.

Culms bulbous-thickened at base, 2–4 dm. high, filiform, glabrous; leaves setaceous, shorter than the culms; bracts mostly shorter than the umbellate inflorescence; spikelets 4–6 mm. long, dark brown, numerous in each glomerule; scales castaneous to dull reddish-brown; achene obovate, trigonous, 0.7–0.9 mm. long, truncate at apex, brown to bluish-gray.

Dry soil at varying altitudes on the mainland. Cuba, Honduras, and northern South America.

COCLÉ: Natá, alt. 50 m., Allen 848. PANAMÁ: Chorrera, Hitchcock 8126.

5. ABILDGAARDIA Vahl

ABILDGAARDIA Vahl, Enum. 2:296. 1806.

Glabrous perennials, with slender culms, narrow setaceous basal leaves, flattened usually solitary spikelets, and an involucre of 1 bract; scales imbricated in two rows, keeled and deciduous; bristles none; stamens 1–3; style pubescent, deciduous, with a somewhat swollen base; achenes trigonous. About 15 species, chiefly in the Old World tropics. Differs from *Bulbostylis* in the glabrous, distichous scales, and the stalked tuberculate achenes with isodiametric cells.

1. *ABILDGAARDIA MONOSTACHYA* (L.) Vahl, Enum. 2:296. 1806.

Cyperus monostachyus L. Mant. 180. 1771.

Fimbristylis monostachya Hasskarl, Pl. Jav. Rar. 61. 1848.



Fig. 32
Abildgaardia
monostachya

Culms slender, tufted, 2–4 dm. high; leaves setaceous, 0.5 mm. wide, half as high as the culms, the involucrel bract shorter than the spikelet; spikelet ovate-lanceolate, 1–1.5 cm. long, many-flowered, the lower scales readily deciduous; scales greenish-white, strongly keeled; style with 3 short branches; achenes 2–2.5 mm. long, yellowish-white, tuberculate, prominently stalked.

An abundant species of wet grassy places, in the tropics of both hemispheres.

PANAMÁ: Las Sabanas, Standley 25906, 40784; Panama Golf Club, Higgins 201.

6. FIMBRISTYLIS Vahl

FIMBRISTYLIS Vahl, Enum. 2:285. 1806.

Plants annual or perennial, the culms leafy below; spikelets usually capitate or on short rays, sometimes solitary, with a leafy involucre; scales concave, usually spirally imbricate, all fertile; perianth none; stamens 1–3; style 2- to 3-cleft, usually with an enlarged deciduous base; achene lenticular, biconvex, or 3-angulate, with quadrangular or horizontally elongate cells. About 125 species of moist soils, chiefly of the Old World tropics.

- a. Style branches 2; achenes lenticular; style frequently fringed below the branches.
- b. Achenes longitudinally striate; plants frequently annual..... 1. *F. ANNUA*
- bb. Achenes not longitudinally striate.
- c. Spikelets in a dense congested inflorescence..... 2. *F. SPATHACEA*
- cc. Spikelets mostly on elongate rays.
- d. Scales puberulent at the base; mature achenes gray to black..... 3. *F. SPADICEA*
- dd. Scales appressed-pubescent at the apex..... 4. *F. FERRUGINEA*
- aa. Style branches 3; achenes trigonous; style not fringed below the branches.
- b. Spikelets 2–4 mm. long, very obtuse..... 5. *F. MILIACEA*
- bb. Spikelets about 6 mm. long, acute..... 6. *F. COMPLANATA*

1. FIMBRISTYLIS ANNUA (All.) R. & S. Syst. 2:95. 1817.

Scirpus diphyllus Retz. Obs. Bot. 5:15. 1789.

Fimbristylis laxa Vahl, Enum. 2:292. 1806.

Fimbristylis polymorpha Boeckl. Vid. Medd. Kjobenhavn 1869:141. 1870.

Annual or perennial, glabrous or pubescent; culms 5–60 cm. high; leaves shorter than the culms; inflorescence loose and open, the spikelets numerous, 5–10 mm. long, solitary, acute, brown or castaneous; style 2-fid, prominently fimbriate; achenes obovoid, biconvex, white or stramineous, with about 10 rows of horizontally-elongated cells on each face and about 10 longitudinal ribs formed by the cell margins.

This species varies greatly in size, the perennial phase being var. *diphylla* Kuekenenthal in Fedde, Rep. Spec. Nov. 23:196. 1926. It is one of the most widely spread plants in the world, in dry or moist habitat, at low altitudes in both tem-

perate and tropical regions. There are 400 or more synonyms.

BOCAS DEL TORO: Changuinola Valley, *Dunlap* 185; Chiriquí Lagoon, *von Wedel* 1255; *Hart* 68. COCLE: Natá, alt. 50 m., *Allen* 845; between Las Margaritas and El Valle, *Woodson, Allen & Seibert* 1724, 1775. COLÓN: Porto Bello, *Pittier* 2455. CANAL ZONE: Balboa Heights, *Killip* 4236; Darién, *Standley* 31572; Summit, *Standley* 29507, 30040, 30054; Gamboa, *Standley* 28471; Frijoles, *Standley* 27647; Gatún, *Standley* 27277; Culebra, *Pittier* 3791; between Fort Clayton and Corozal, *Standley* 29079; and many other collections. PANAMÁ: east of Pacora, ca. 25 m., *Woodson, Allen & Seibert* 742, 745; between Pacora and Chepo, ca. 25 m., *Woodson, Allen & Seibert* 1633, 1636; Nuevo San Francisco, *Standley* 30726; Río Tapia, *Standley* 28821; Río Tecúmen, *Standley* 29404; Taboga Island, *Killip* 4151; Juan Díaz, *Killip* 4059, 4052; Matías Hernández, *Standley* 28900; Panamá, *Standley* 27822; Punta Paitilla, *Standley* 26299; Las Sabanas, *Standley* 25905; Chepo, *Pittier* 4528; Isthmus of Panama, *Fendler* 345.

2. FIMBRISTYLIS SPATHACEA Roth, Nov. Pl. Ind. Or. 24. 1821.

Scirpus glomeratus Retz. Obs. Bot. 4:11. 1876; not L. Sp. Pl. 52. 1753.

Fimbristylis glomerata Urban, Symb. Antill. 2:166. 1900; not Nees, 1834.

Glabrous perennial, with short thick rhizomes, the culms stout, 10–40 cm. high; leaves narrow, stiff; spikelets numerous, crowded, 3–6 mm. long, obtuse, brownish; achene obovate, 0.8 mm. long, becoming purplish-black at maturity, the rugose surface minutely reticulate.

Atlantic coast. Widely distributed on tropical beaches of both hemispheres.

BOCAS DEL TORO: without locality, *von Wedel* 501. CANAL ZONE: Fort Sherman, *Standley* 31205; *Piper* 5884; France Field, *Standley* 28579; Cristobal, *Pittier* 4234.

3. FIMBRISTYLIS SPADICEA (L.) Vahl, Enum. 2:294. 1806.

Scirpus spadiceus L. Sp. Pl. 51. 1753.

Scirpus castaneus Michx. Fl. Bor.-Amer. 1:31. 1803.

Scirpus puberulus Michx. op. cit.

Glabrous to pubescent perennial, often with elongate rhizomes, the culms 3–10 dm. high; leaves narrow, stiff, the bases indurate and castaneous or blackish; spikelets few or numerous, 1–1.5 cm. long, the scales obtuse, glabrous or puberulous, apiculate, dark brown with paler veins imbedded in the tissue; achene biconvex, obovate, with deep-pitted horizontally elongated cells, and narrowed at the base to a minute purplish annulus.

Sea beaches or tidal flats, often extending inland. Temperate and tropical America.

COLÓN: Viento Frio, *Pittier* 4139. SAN BLAS: Puerto Obaldía, *Pittier* 4401. CANAL ZONE: Balboa, *Standley* 25622; Fort Randolph, *Standley* 28752, 30880; Victoria Fill, near Miraflores Locks, *Allen* 1703, 1728; Pedro Miguel, 15–30 m., *Allen* 4; Cristobal, *Pittier* 4235; Corozal, *Killip* 4338.

4. FIMBRISTYLIS FERRUGINEA (L.) Vahl, Enum. 2:291. 1806.

Scirpus ferrugineus L. Sp. Pl. 50. 1753.

Perennial, with short rhizomes; culms filiform to 2 mm. wide, 2–8 dm. high; leaves much shorter than culm, the blades often nearly obsolete; spikelets commonly 5–10, ovoid-oblong, 8–20 mm. long, the scales brown or ferruginous, pilose-

puberulent toward the apex; achene obovate, biconvex, dull yellow, opaque, the surface lightly reticulate.

Maritime shores from Cuba southward; tropics of Old World.

COLÓN: Colón, *Lehmann* 998. CANAL ZONE: France Field, *Standley* 28581.

5. *FIMBRISTYLIS MILIACEA* (L.) Vahl, Enum. 2:287. 1806.

Scirpus miliaceus L. Syst. Nat. ed. 10. 868. 1759.

Trichelostylis miliacea Nees in Wight, Contrib. Bot. India, 103. 1834.

Annual, slender, glabrous, 2–7 dm. high; leaves soft, 1–3 mm. wide, usually shorter than the culms; spikelets numerous, subglobose, 2–4 mm. long, brown, in a decompound inflorescence; achenes trigonous, minute (0.5 mm. long), pale brown, frequently iridescent.

In wet, often sandy soil, at low altitudes. Tropical regions of both hemispheres.

BOCAS DEL TORO: Changuinola Valley, *Dunlap* 244. CHIRIQUÍ: vic. David, *Hitchcock* 8370. CANAL ZONE: Victoria Fill near Miraflores Locks, *Allen* 1719; Gatún, Bro. *Heriberto* 52; J. F. *Cowell* 317; Darién, *Standley* 31538, 31506; Summit, *Standley* 30143; Río Pedro Miguel, *Standley* 30023; Frijoles, *Standley* 27645; Culebra, *Hitchcock* 8116; Fort Randolph, *Standley* 28633, 28621; and other collections. PANAMÁ: Las Sabanas, *Standley* 25942; Chepo, *Pittier* 4614, 4530; Almirante, *Rowlee & Stork* 993; Punta Paitilla, Bro. *Heriberto* 232; Matías Hernández, *Standley* 31937, 28903; Nuevo San Francisco, *Standley* 30749; Juan Díaz, *Killip* 4049; Panamá, *Standley* 27793; Río Tecúmen, *Standley* 26523. DARIÉN: El Real, ca. 15 m., *Allen* 953, 963.

6. *FIMBRISTYLIS COMPLANATA* (Retz.) Link, Hort. Berol. 1:292. 1827.

Scirpus complanatus Retz. Obs. Bot. 5:14. 1789.

Annual, or perennial with very short rhizomes, glabrous, 2–8 dm. high; leaves 2–6 mm. wide, shorter than the strongly compressed culms; spikelets numerous, linear, 5–10 mm. long, in a decompound inflorescence; achenes trigonous, pale brown, 0.7–0.9 mm. long, usually with horizontally elongate reticulation.

In dry fields or savannas. Widely distributed in the tropics of both hemispheres.

CHIRIQUÍ: Finca Lérída to Boquete, ca. 1300–1700 m., *Woodson, Allen & Seibert* 1153. COCLÉ: El Valle, 800–1000 m., *Allen* 746; Aguadulce, *Pittier* 4924, 4869; Penonomé, *Williams* 307. PANAMÁ: between Pacora and Chepo, ca. 25 m., *Woodson, Allen & Seibert* 1635; Corozal Road, *Killip* 4096; Orange River, *Killip* 4178.

7. *SCIRPUS* L.

SCIRPUS L. Sp. Pl. 47. 1753.

Annuals or perennials, the culms leafy below, or the leaves often reduced to sheaths; flowers perfect, the spikelets terete or slightly compressed; scales spirally imbricate; perianth of 1–6 bristles, or lacking; stamens 2–3; style 2- to 3-cleft, frequently deciduous; achene triangular or lenticular. About 200 species, widely distributed, chiefly in temperate regions.

1. *SCIRPUS CUBENSIS* Kunth, Enum. 2:172. 1837.

Plants stout, perennial, glabrous, with long stolons, the culms erect or decum-

bent, 30–70 cm. long; leaves basal, strongly reticulate, 5–9 mm. wide, usually equaling the culms; bracts long and leaf-like; inflorescence mostly on rays 1–5 cm. long, of dense globose heads, 1–1.5 cm. in diameter; spikelets 4–8 mm. long; scales ovate, acute, brown; style bifid; achene narrowly obovoid, smooth, pale; bristles none.

Usually growing in shallow water. Widely distributed in tropical America.

CANAL ZONE: Frijoles, Killip 4305; Piper 5827; Ancón, Dunn in 1916; Darién Station, Standley 31530; Barro Colorado Island, Kenoyer 157; Gigante Bay, Dodge 3485.

8. FUIRENA Rottb.

FUIRENA Rottb. Descr. & Icon. 70. 1773.

Plants perennial, with leafy triangular culms; spikelets many-flowered, terete, in terminal and axillary clusters, or solitary; scales spirally imbricate, awned, the lowest 1 or 2 usually empty; flowers perfect; perianth of 6 bristles (scales), frequently thickened and sometimes becoming ovate; stamens 3; style 3-cleft, deciduous; achenes 3-angulate, smooth, stipitate or sessile. About 30 species, in the warmer regions of both hemispheres.

- | | |
|---|------------------|
| a. Clusters of spikelets few, usually 4–5; leaves short, the blades less than 7 mm. wide, sparsely or densely pilose. | 1. F. INCOMPLETA |
| aa. Clusters of spikelets numerous; leaves elongate, 8 mm. wide or more, glabrous or scabrous. | |
| b. Inner bristles obovate, scarcely stipitate, scarcely thickened at the apex. | 2. F. UMBELLATA |
| bb. Inner bristles ovate-lanceolate, conspicuously stipitate, much thickened at the apex. | 3. F. ROBUSTA |

1. FUIRENA INCOMPLETA Nees in Mart. Fl. Bras. 2¹:107. 1843.

Culms rather slender, about 60 cm. long; leaves stiff, the blades 5–12 cm. long; spikelets 8–12 mm. long, the scales pubescent, aristate, not closely appressed; bristles 4–6, slender, equaling or exceeding the achene, retrorsely barbed.

Wet meadows. Known also from Brazil.

CHIRIQUÍ: El Boquete, Killip 4573; Hitchcock 8260.

2. FUIRENA UMBELLATA Rottb. Descr. & Icon. 70. pl. 19, f. 3. 1773; C. B. Clarke, Ill. Cyp. t. 59, f. 9. 1909.

Plants with creeping rhizomes; culms 0.5–1.5 m. long, stout, sometimes pilose above, often bulbous at the base; leaves 7–16 cm. long, 8–25 mm. wide, usually scabrous; spikelets oblong, 6–10 mm. long, clustered, the scales pubescent, aristate, with spreading or recurved awns; bristles ovate, membranous, not stipitate.

An abundant species in damp places, in tropics of both hemispheres.

BOCAS DEL TORO: Maccaw Hills, Colón Island, alt. 0–120 m., von Wedel 545; Colón Island, Chiriquí Lagoon, von Wedel 2706; Changuinola Valley, Dunlap 169. COCLÉ: between Las Margaritas and El Valle, Woodson, Allen & Seibert 1716. CANAL ZONE: between Corozal and Ancón, Pittier 2182; Frijoles, Killip 12184; Darién Station, Standley 31583; between France Field and Catival, Standley 30393; Fort Randolph, Standley 28619. PANAMÁ: east of Pacora, 25 m., Woodson, Allen & Seibert 756; Chepo, Pittier 4550.

3. *Fuirena robusta* Kunth, Enum. 2:185. 1837; C. B. Clarke, Ill. Cyp. *t.* 59, *f.* 12. 1909.

Culms stout, glabrous or nearly so; leaves elongate, 1-2 cm. wide, scabrous; spikelets very numerous, grayish puberulent, 1-1.5 cm. long, the scales pubescent; bristles fleshy, nearly twice as long and as thick as the achene.

Brazil, Dutch Guiana; known from Panama only from the collection by Fendler.

CANAL ZONE: Chagres, Fendler 353, Jan. 10, 1850.

9. ASCOLEPIS Nees

ASCOLEPIS Nees ex Steud. Syn. Cyp. 105. 1855.

Glabrous annuals closely resembling *Lipocarpus*; spikes composed of numerous closely imbricated 3-scaled reduced spikelets, of which the outermost scale is linear and obscure, and the two innermost fused to form a prominent obovate saccate scale containing the plano-convex to trigonous elongate achene; stamens 2 or 3; style 2- to 3-cleft. About 9 species, chiefly in tropical Africa.



Fig. 33
Ascolepis brasiliensis

1. *ASCOLEPIS BRASILIENSIS* (Kunth) Benth. ex Clarke in Durand & Schinz, Consp. Fl. Afr. 5:651. 1895.

Platylepis brasiliensis Kunth, Enum. 2:269. 1837.

Plants perennial (?), tufted, glabrous, the culms 2-5 dm. high, slender; leaves basal, stiff, much shorter than the culms, with reddish sheaths and filiform blades; spikelets 1-3, sessile, terete, acute, subtended by 2 linear bracts, 6-12 mm. long; outer scale of spikelet obscure, narrowly lanceolate, the inner scales larger and fused to form a compressed rounded short-acuminate utricle enclosing the style and stamens; style bifid; achene oblong, 1 mm. long, obscurely trigonous, densely papillose.

Wet meadows. Brazil; tropical Africa and Madagascar. CHIRIQUÍ: El Boquete, Killip 4750.

10. LIPOCARPHA R. Br.

LIPOCARPHA R. Br. App. Tuckey Exp. Congo, 459. 1818. Cf. Pfeiffer in Fedde, Rep. Spec. Nov. 39:38-43. 1935.

Glabrous annuals or perennials, with leaves usually much shorter than the culms; inflorescence terminal, of several terete, sessile spikes, with an involucre of 2 or 3 leafy to subulate bracts; the individual spikes composed of numerous closely imbricated 3-scaled reduced spikelets, of which only the outermost scale is promi-

ment, the 2 hyaline and obscure inner scales enveloping the plano-convex to trigonous elongate achene; stamens 1 or 2; style 2-3-cleft. About 14 species in the tropics of both hemispheres.

- a. Rigid perennial; scales broadly obovate; achene obovate. 1. *L. SELLOWIANA*
 aa. Annual with soft leaves; scales narrow; achene linear. 2. *L. MACULATA*

1. *LIPOCARPHA SELLOWIANA* Kunth, Enum. 2:267. 1837; Osten, Anal. Mus. Hist. Nat. Montevideo, II. 3:116, f. 28. 1932.

Perennial, with rigid sulcate culms 1.5-8 dm. long, 1.0-1.5 mm. wide; leaves basal, much shorter than the culm, 1.0 mm. wide or less, both sheaths and blades indurated, the blades serrulate at the apex; inflorescence terminal, of 3-5 sessile spikes, with 2 involucre bracts 1-7 mm. long; scales firm, subaristate, frequently incurved, yellow to dull brown, 1.0-1.5 mm. wide, broadly cuneate-obovate; inner scale hyaline, only slightly longer than the achene which it encloses; achene narrowly obovate, 1.0-1.2 mm. long, 0.5 mm. wide, yellow to dull brown, prominently papillose.

Mostly in bogs from 600 to 1500 m.; of scattered distribution from Mexico to Paraguay.

CHIRIQUÍ: El Boquete, alt. 1200-1500 m., Woodson & Schery 747; Cornman 2697; Llanos del Volcan, Seibert 370. COCLÉ: El Valle de Antón, Allen 1993.

2. *LIPOCARPHA MACULATA* (Michx.) Torr. Ann. N. Y. Lyc. 3:288. 1836.

Kyllinga maculata Michx. Fl. Bor.-Am. 1:29. 1805.

Lipocarpus sphaelata (Vahl) Kunth, Enum. 2:267. 1837; at least as to citations from Panama.

Cespitose annual, with slender sulcate culms 0.5-3.5 dm. long, 0.5-1 mm. wide; leaves basal, soft, 1-2 mm. wide, shorter than, or sometimes equalling the culm; inflorescence terminal, of 3-5 sessile spikes, with 2-3 involucre bracts 1-12 cm. long; spikes ovoid, obtuse, terete, 4-10 mm. long; scales hyaline to sub-rigid, acute, frequently incurved, yellow to purple, 0.7-0.8 mm. wide, lanceolate to broadly cuneate, inner scale hyaline, carinate, often nearly twice as long as the achene which it encloses; achene linear, 0.9-1.2 mm. long, 0.3-0.4 mm. wide, yellow to dark brown, lightly papillose.

Moist places, southern United States and southward in the tropics.

COCLÉ: Antón, Woodson, Allen & Seibert 1710; Aguadulce, Pittier 4895. CANAL ZONE: Darién Station, Standley 31507; Chagres, Fendler 344, 346. PANAMÁ: sea level, Las Sabanas, Standley 40769; Juan Díaz, Killip 4050; Chepo, Pittier 4522; Nuevo San Francisco, Standley 30762; Matías Hernández, Standley 28996; Panamá, Standley 27812.

11. REMIREA Aubl.

REMIREA Aubl. Hist. Pl. Guian. 1:45, t. 16. 1775. Cf. Pfeiffer, Rep. Spec. Nov. 29:180-185. 1931, and 39:187-192. 1936.

Stiff creeping perennial with cord-like rootstocks; the inflorescence terminal, of 3-4 sessile terete spikes, with an involucre of several leafy bracts; the individual spikes composed of loose nearly terete spikelets, each 4-scaled, the uppermost scale

of each spikelet corky and enclosing the single linear trigonous achene; stamens 3; style 3-cleft. A single species in maritime sands of the tropics in both hemispheres.

1. *REMIREA MARITIMA* Aubl. Pl. Guian. 1:45. t. 16. 1775.

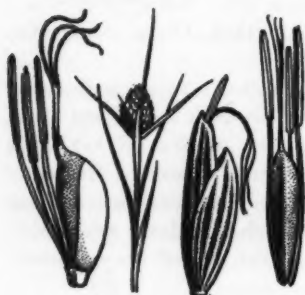


Fig. 34
Remirea maritima

A glabrous perennial with long slender rhizomes; culms 5–30 cm. long, erect or nearly prostrate, densely leafy; leaves spreading, stiff, 2–8 cm. long; bracts 2–6, similar to the leaves; spikelets in a dense head, 1-flowered, brownish, 3–5 mm. long, the inner scale corky and inflated; stamens 3; style usually 3-cleft; achene 2 mm. long, elliptic, obscurely trigonous, apiculate, dark brown, lightly papillose.

A stiff plant of tropical shores of both hemispheres, with roots extending deeply into the sand. Said by Standley to have been collected by Fendler at Chagres.

12. *CLADIUM* P. Br.

CLADIUM P. Br. Civ. & Nat. Hist. Jam. 114. 1756.

Mariscus Zinn, Cat. Hort. Goett. 79. 1757.

Leafy perennials with habit of *Rynchospora*, the panicles elongate to diffuse; spikelets terete, with many scales; middle scales frequently subtending staminate flowers, only the uppermost flower fertile; achene terete, spongy, the surface smooth or ridged, not capped by a tubercle; stamens 2 or 3; style 2- to 3-cleft. About 40 species chiefly in the Old World Tropics.

1. *CLADIUM JAMAICENSE* Crantz, Inst. 1:362. 1766.

Schoenus Mariscus L. Sp. Pl. 42. 1753 (in part).

Cladium Mariscus R. Br. Prodr. Fl. Nov. Holl. 236. 1810.

Mariscus jamaicensis Britton in Britt. & Brown, Illustr. Fl. 1:348. 1913.

A coarse perennial 1.5–3 m. high, the culms obtusely triangular, leafy; leaves elongate, 6–20 mm. wide, the margins spinulose-serrulate; spikelets 2–5 in a cluster, in large panicles, acute-ovoid, 4–5 mm. long, the uppermost flower perfect; perianth none; stamens 2; achene ovoid, 2 mm. long, sharp-pointed, wrinkled, narrowed to the base.

A widely-distributed species, from Florida southward; known as saw-grass.

13. *DICHROMENA* Michx.

DICHROMENA Michx. Fl. Bor. Amer. 1:37. 1803.

Plants perennial; spikelets few, pointed, compressed, several- to many-flowered, in a dense terminal head, surrounded by an involucre of bracts, these often white

at the base; scales spirally imbricate, some of them empty or with imperfect flowers; perianth none; stamens 3; style 2-cleft; achene lenticular, transversely rugose, capped by the persistent style base (tubercle). About 20 species, in the Western Hemisphere.

- a. Leaves 5-12 mm. wide; bracts green at the base. 1. *D. WATSONI*
 aa. Leaves 2-4 mm. wide; bracts sometimes whitish.
 b. Scales of the spikelet pubescent; achenes with about 6 prominent transverse ridges. 2. *D. PUBERA*
 bb. Scales of the spikelet glabrous; achenes minutely undulate. 3. *D. CILIATA*

1. *DICHROMENA WATSONI* Britton, Bull. Torrey Club 15:101. 1888.

Perennial; culms stout, tufted, 1.5-6 dm. high, leafy; leaves 10-20 cm. long, glabrous; bracts about 9, resembling the leaves; spikelets about 9, brown, 12-15 mm. long, mostly hidden by the prominent involucre; achene transversely rugose, 1 mm. long, nearly orbicular, with a very broad flattened style-base.

Guatemala to Panama in forests at low elevations.

CANAL ZONE: Quebrada Salamanca, 70- m., Steyermark & Allen 17145; Frijoles, Standley 27559.



Fig. 35
Dichromena pubera

2. *DICHROMENA PUBERA* Vahl, Enum. 2:241. 1806; C.B. Clarke, Ill. Cyp. t. 63, f. 2-4. 1909.

Usually perennial; culms tufted, 1.5-4 dm. high; leaves numerous, usually shorter than the culms, 2-4 mm. wide, glabrous or pubescent; bracts ciliate at the base, elongate; spikelets elongate, 2-6, 5-8 mm. long; achenes sub-orbicular, deeply ridged transversely.

Tropical South America.

BOCAS DEL TORO: Water Valley, Chiriquí Lagoon, von Wedel 1418. SAN BLAS: Puerto Obaldía, Pittier 4372. CANAL ZONE: Barro Colorado Island, Standley 40831; Ancón Hill, Cornman 2556. PANAMÁ: Corozal Road, Standley 26849; Punta Paitilla, Bro. Heriberto 233.

3. *DICHROMENA CILIATA* Vahl, Enum. 2:240. 1806; C.B. Clarke, Ill. Cyp. t. 63, f. 5. 1909.
Dichromena radicans of auths., probably not of Chamisso & Schlechtendal.

Culms 1-7 dm. high, slender; leaves 10-30 cm. long, glabrous or pilose; bracts 4-6, usually ciliate toward the base; spikelets 3-15, 5-10 cm. long, the scales glabrous and usually tinged with brown; achene 1-1.5 mm. long, obovate, brown or black, with numerous minute transverse undulations.

An abundant species, widely dispersed from the West Indies and Mexico to tropical South

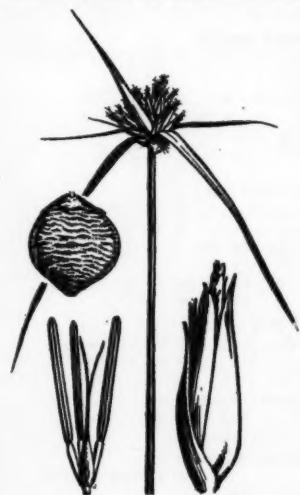


Fig. 36
Dichromena ciliata

America. The accompanying figures agree with Clarke's illustrations, and with the specimens in Vahl's herbarium examined by me in 1937.

CANAL ZONE: Ancón Hill, *Greenman & Greenman* 5139; Ancón, *Standley* 26362; Balboa, *Maxon* 6928; *Standley* 25468, 32100; Chivi-Chivi Trail, *Piper* 5758; Corozal, *Standley* 29105; Colón, *Rose* 22060; Mt. Hope Cemetery, *Standley* 28778; Culebra, *Bro. Celestine* 64; *Hitchcock* 8119. PANAMÁ: Arraiján, ca. 15 m., *Woodson, Allen & Seibert* 1393; east of Pacora, ca. 25 m., *Woodson, Allen & Seibert* 744; Savana de Alhajuela, *Pittier* 3480; Río Tapia, *Maxon & Harvey* 6629; *Standley* 28157; Río Tecúmen, *Standley* 26615; Matías Hernández, *Standley* 28866; Juan Díaz, *Standley* 31984; Chepo, *Pittier* 4466; Bella Vista, *Macbride* 2746; Taboga Island, *Pittier* 3580; Las Sabanas, *Standley* 25915. DARIÉN: El Real, ca. 15 m., *Allen* 954.

14. RYNCHOSPORA Vahl

RYNCHOSPORA Vahl, Enum. 2:229. 1806.

Plants mostly perennial, sometimes annual, the culms 3-angulate or terete; spikelets oblong or fusiform, variously arranged, the scales 1-nerved, spirally imbricate; upper flowers staminate, the lower perfect; perianth of bristles, or sometimes wanting; stamens usually 3; style 2-cleft or rarely entire; achene lenticular or turgid, smooth or transversely rugose, capped by the persistent style base. About 200 species, widely distributed, especially in warm regions.

- a. Spikelets all crowded in a single dense head.
 - b. Bracts 10-30 cm. long; leaves 8-15 mm. wide..... 1. *R. CEPHALOTES*
 - bb. Bracts 4 cm. long or less; leaves 3 mm. wide or narrower.
 - c. Plants glabrous; bracts not ciliate..... 2. *R. GLOBOSA*
 - cc. Plants pubescent; bracts ciliate.
 - d. Bracts partly leaf-like; outer spikelets reflexed or spreading..... 3. *R. BARBATA*
 - dd. Bracts all thin and scarious; spikelets all erect..... 4. *R. ARMERIODES*
- aa. Spikelets variously arranged but never in a single head.
 - b. Branches of the style equaling or longer than the undivided portion.
 - c. Spikelets 1-1.5 mm. long..... 5. *R. MICRANTHA*
 - cc. Spikelets 3-10 mm. long.
 - d. Achenes reticulate..... 6. *R. HIRSUTA*
 - dd. Achenes transversely rugose.
 - e. Spikelets in congested heads; dwarf annual plants; achene 1 mm. long, tridentate at the apex..... 7. *R. SETACEA*
 - ee. Spikelets in wide-spreading corymbs.
 - f. Base of the style depressed, almost discoid; scales very acute..... 8. *R. EXIMIA*
 - ff. Base of the style pyramidal; scales obtuse..... 9. *R. ROBUSTA*
 - bb. Branches of the style short or none, much shorter than the undivided portion.
 - c. Spikelets in globose heads..... 10. *R. CYPEROIDES*
 - cc. Spikelets not in globose heads.
 - d. Spikelets fasciculate, in 2's-6's, yellow or yellow-brown.
 - e. Inflorescence elongate, of several corymbs..... 11. *R. CORYMBOSA*
 - ee. Inflorescence a single corymb..... 12. *R. AMAZONICA*
 - dd. Spikelets mostly solitary, greenish or chestnut-brown,
 - e. Inflorescence much shorter than the basal leaves; leaves silvery..... 13. *R. ARGENTEA*
 - ee. Inflorescence much surpassing the basal leaves; leaves green.
 - f. Bristles obsolete or nearly so; spikelets stramineous; inflorescence-branches elongate..... 14. *R. POLYPHYLLA*
 - ff. Bristles equaling or longer than the achenes; spikelets greenish to dark brown; inflorescence-branches broadly triangular.

- g. Spikelets 3-4 mm. long.....15. R. LOCUPLES
 gg. Spikelets dark brown, 7-9 mm. long.....16. R. MACROCHAETA

1. *RYNCHOSPORA CEPHALOTES* (L.) Vahl, Enum. 2:237. 1806.

Scirpus cephalotes L. Sp. Pl. ed. 2. 76. 1762.

Rhizomes coarse; culms usually 1 m. high, leafy; leaves long, flat, 4-12 mm. wide, scabrous on the margin; spikelets greenish or pale brown, numerous in a dense ovoid head 2-4 cm. long; bracts large and leaf-like; spikelets about 7 mm. long; achene 1.5 mm. long, nearly orbicular, light brown, reticulate; bristles 6, equaling the achene, the beak longer than the body.

An abundant forest species, Mexico and the West Indies to northern South America. The plant is rarely collected in fruit.

VERAGUAS: between Cañazas and the foot of the Cordillera Central, headwaters of Río Cañazas, 300-600 m., Allen 182. CANAL ZONE: Río Indio, 70-100 m., Dodge & Allen 17373, 17375; Ancón Hill, Greenman & Greenman 5103; Barro Colorado Island, Svenson 426. PANAMÁ: Arraiján, ca. 15 m., Woodson, Allen & Seibert 1382; along Río Tecúmen, n. of Chepo road, up to 30 m., Hunter & Allen 246; Taboga Island, G. S. Miller 2039; Trapeche Island, Pearl Islands, Miller 1897.

2. *RYNCHOSPORA GLOBOSA* (HBK.) R. & S. Syst. 2:89. 1817.

Glabrous, culms 3-9 dm. high, in small dense tufts; leaves basal, 15-50 cm. long, 3-5 mm. wide, stiff and rigid, brown and indurate below; heads globose, 1-2 cm. in diameter; one of the bracts longer than the head, the others shorter; spikelets brownish, a single achene maturing in each; scales rigid, obtuse; achene biconvex, truncate, dark brown, the white narrow beak half as long as the achene; bristles 5, upwardly barbed, almost plumose.

Dry hillsides; Mexico and the West Indies to Bolivia.

COCLÉ: between Las Margaritas and El Valle, Woodson, Allen & Seibert 1284. PANAMÁ: Taboga Island, ca. 0-186 m., Woodson, Allen & Seibert 1476.

3. *RYNCHOSPORA BARBATA* (Vahl) Kunth, Enum. 2:290. 1837.

Schoenus barbatus Vahl, Eclog. Amer. 2:4. 1798.

Chaetospora pterocarpa HBK. Nov. Gen. & Sp. 1:230. 1816.

Rynchospora pterocarpa R. & S. Syst. 2:89. 1817; C. B. Clarke, Ill. Cyp. t. 5, f. 4-6. 1909



Fig. 37
Rynchospora barbata

Plants in small dense tufts, the culms slender, 1-5 dm. high; leaves basal, pilose, usually much shorter than the culms, 1-2 mm. wide; heads globose, about 1 cm. in diameter, brownish, subtended by about 4 short bracts; achene obovoid, black, 1-1.5 mm. long, with a broad membranous silvery wing 2 mm. broad with involute margins; bristles 4-5, equaling or exceeding the achene.

Dry to wet grasslands; Honduras, Panama, and the West Indies to southern Brazil.

COCLÉ: El Valle, 800-1000 m., Allen 768; Natá, alt. 50 m., Allen 849. PANAMÁ: between Panamá and Chepo, Dodge, Hunter, Steyermark & Allen 16693; Pacora, alt.

ca. 35 m., *Allen* 993; Chepo, 30 m., *Hunter & Allen* 39; between Pacora and Chepo, ca. 25 m., *Woodson, Allen & Seibert* 1639.

4. *RYNCHOSPORA ARMERIOIDES* Presl, Rel. Haenk. 1:197. pl. 31, f. 2. 1828.

Culms tufted, 0.5–3 dm. high; leaves basal, shorter than the culms, more or less ciliate, 2–3 mm. wide; heads frequently 1 cm. high, pale brown, the outer scales enlarged and ascending; achene linear, 2.5 mm. long, strongly compressed, pale brown, the surface minutely roughened, beak compressed, translucent white, elongate; bristles 5, three times as long as the achene-body, upwardly barbed.

Savannas; Costa Rica, Panama and South America. (TYPE from Panama.)

PANAMÁ: Bejuco, *Allen* 983; Pacora, alt. ca. 35 m., *Allen* 992; between Panamá and Chepo, *Dodge, Hunter, Steyermark & Allen* 16688.

5. *RYNCHOSPORA MICRANTHA* Vahl, Enum. 2:231. 1806.

Dicbromena micrantha Kunth, Enum. 2:278. 1837.

Plants annual, slender, weak, 1–5 dm. high, the culms leafy; leaves shorter than the culms, 1–1.5 mm. wide; spikelets clustered, about 1.5 mm. long, in lax, slender corymbs; achene obovate, biconvex, 0.8 mm. long, white to dull gray, transversely rugose, with a broad depressed style-base; bristles lacking.

Wet grassy places at lower elevations, Central America and West Indies; tropical Africa.

CANAL ZONE: Ancón Hill, *Cornman* 2559. PANAMÁ: Chepo, 30 m., *Hunter & Allen* 46, 48.

6. *RYNCHOSPORA HIRSUTA* Vahl, Enum. 2:231. 1806.

Schoenus hirsutus Vahl, Eclog. Amer. 1:6. 1796.

Annual, 10–30 cm. high, hairy-setose, the culms slender, leafy; leaves equaling or shorter than the culms, 1–3 mm. wide, frequently inrolled; corymbs 2–4 cm. broad; spikelets numerous, 4 mm. long, brown or castaneous; achene minute, biconvex, coarsely reticulate, yellow-brown, suborbicular, the style-base depressed-conic; bristles lacking.

Panama (cited by Standley), Cuba and northern South America.

7. *RYNCHOSPORA SETACEA* (Berg) Boeckl. Vid. Medd. Kjobenhavn 1869:159. 1870.

Schoenus setaceus Berg. Act. Helv. 7:130. pl. 9. 1772.

Rynchospora tenerima Spreng. Syst. Veg. Cur. Post. 26. 1827; C. B. Clarke, Ill. Cyp. t. 71, f. 11–12. 1909.

Glabrous annual with slender leafy culms 1–3 dm. high; leaves setaceous, 10–15 cm. long, 1–2 mm. wide; corymbs loose, the spikelets few, 4 mm. long, pale, long-awned, overtopped by the bracts and upper stem-leaves; achenes 1 mm. long, transversely undulate, brown, the apex tridentate due to the upturned margins of the style-base; bristles none.

Dry savannas; Panama, West Indies and tropical South America.

PANAMÁ: Las Cruces Trail, *Cornman* 2614.

8. *RYNCHOSPORA EXIMIA* (Nees) Boeckl. Linnaea 37:601. 1873.

Spermodon eximius Nees in Seem. Bot. Voy. Herald, 222. 1854.

Glabrous annual; culms slender, 1-4 dm. high; leaves often exceeding the culms, 1-3 mm. wide; corymbs spreading, the long-pedicelled spikelets relatively few, 7-10 mm. long, dark brown; achenes suborbicular, yellow-brown, 1.5 mm. long, transversely rugose, the two flattened lateral lobes of the style-base decurrent on the apex of the achene; bristles none.

Wet savannas, chiefly at low altitudes. Further distribution: Mexico, Honduras, Cuba.

COCLÉ: Natá, ca. 50 m., *Allen 819*. PANAMÁ: Pacora, alt. ca. 35 m., *Allen 991*; Orange River, *Cornman 2508*.

9. *RYNCHOSPORA ROBUSTA* (Kunth) Boeckl. *Linnaea* 37:616. 1873.

Dichromena robusta Kunth, *Enum.* 2:283. 1837.

Perennial, glabrous except the inflorescence branches; culms leafy, 6-10 dm. high; leaves shorter than the culms, about 6 mm. wide, prominently striate, glaucous; cymes much-branched, large and broad, the acute glaucous-brown spikelets numerous, 7 mm. long; achene obovate, biconvex, 2.5 mm. long, stipitate, pale brown, the surface spinescent-papillose and lightly transversely ridged, style-base nearly as long as the achene, obtuse, glaucescent, the two lateral lobes prominent; bristles none.

In swamps, southern Mexico to South America.

CHIRIQUÍ: El Boquete, alt. 1200-1500 m., *Woodson & Schery 730, 742*.

10. *RYNCHOSPORA CYPEROIDES* (Sw.) Mart. *Denkschr. Akad. Wiss. Muenchen* 6:149. 1816-17.

Schoenus cyperoides Sw. *Prodr.* 19. 1788.

Rynchospora polycephala Kunth, *Enum.* 2:291. 1837.

Glabrous perennial; culms 2-8 dm. high, leafy; leaves frequently longer than the culms, 2-5 mm. wide; heads 1-15, in a loose corymb 8-10 mm. in diameter, brown, the bracts filiform; achene 1-1.5 mm. long, narrowly obovate, smooth or transversely lightly undulate, roughened, the upper margin spinescent, brown, the scabrous beak equaling or exceeding the achene; bristles 6, upwardly barbed, exceeding the achene.

Wet savannas, chiefly below 100 m. altitude. West Indies, Mexico to Uruguay; tropical Africa.

PANAMÁ: east of Pacora, ca. 25 m., *Woodson, Allen & Seibert 750*; between Pacora and Chepo, ca. 25 m., *Woodson, Allen & Seibert 1640*; northeast of Hacienda La Joya, 50-300 m., *Dodge, Hunter, Steyermark & Allen 16914*.

11. *RYNCHOSPORA CORYMBOSA* (L.) Britton, *Trans. N. Y. Acad. Sci.* 11:85. 1892.

Scirpus corymbosus L. *Cent.* 2:7. 1756.

Rynchospora polycephala Kunth, *Enum.* 2:291. 1837.

Perennial, with culms scabrous above, stout, 6-10 dm. high; leaves long, 1-2 cm. wide; the several dense corymbs forming an interrupted inflorescence 2-4 dm. long; spikelets very numerous, 6-7 mm. long, containing a single achene; achene 2-3 mm. long, narrowly obovate, faintly reticulate, dark brown, the corky-

thickened beak equaling the achene; bristles 6, exceeding the achene, upwardly barbed.

Tropics of both hemispheres.

BOCAS DEL TORO: Old Bank Island, Chiriquí Lagoon, *von Wedel 2129*.

12. *RYNCHOSPORA AMAZONICA* Poepp. & Kunth ex Kunth, Enum. 2:292. 1837.

Culms triangular, leafy, slender, 5–10 dm. high; leaves 4–9 mm. wide, elongate, thickened, the margins tending to be revolute; inflorescence a corymb, the primary rays 5–9 cm. long, almost filiform; spikelets in clusters of 2–6 at the ends of primary rays and of filiform secondary rays (2–4 cm. long); spikelets dull brown, ovate-oblong, 5–7 mm. long; achene ellipsoid-obovate, 3 mm. long, compressed, dark brown, impressed-punctulate to rugose, the subulate pale yellow beak dilated at the base and exceeding the achene; bristles upwardly scabrous, exceeding the achene.

Boggy grasslands; tropical South America.

PANAMÁ: between Pacora and Chepo, ca. 25 m., *Woodson, Allen & Seibert 1663*.

13. *RYNCHOSPORA ARGENTEA* Standl. Contrib. U. S. Nat. Herb. 18:87. 1916.

Perennial; culms slender and weak, 20 cm. high or less; leaves silvery, 30–40 cm. long, 2–3 cm. wide, glabrous, scabrous on the margins; inflorescence much shorter than the leaves; corymbs small, the spikelets few, pale, 7 mm. long, solitary, pedicellate; bristles 6, white; fruit unknown.

SAN BLAS: *Pittier 4307*, known only from this collection.

14. *RYNCHOSPORA POLYPHYLLA* Vahl, Enum. 2:230. 1806.

Schoenus polyphyllus Vahl, Eclog. Amer. 2:5. 1798.

Perennial, with slender rhizomes, the leaves and inflorescence usually short-pubescent; culms often 1 m. long, weak and often reclining; leaves equaling the culms, 4–7 mm. wide; panicles elongate, often 2–3 dm. long, narrow, the pale spikelets very numerous; achene obovate, 1.5 mm. long, pale brown, reticulate, the flattened glaucescent beak exceeding the achene; bristles none.

In moist forests, Mexico and the West Indies to northern South America.

CHIRIQUÍ: El Boquete, *Davidson 751*; *Killip 4538*.

15. *RYNCHOSPORA LOCUPLES* Clarke, Engler's Bot. Jahrb. 34, Beibl. 78:5. 1904.

Perennial; the stout leafy glabrous culms nearly 1 m. high; leaves 10–18 mm. wide; panicles very large, the spikelets extremely numerous, pale brown, 3 mm. long, each maturing a single achene; achene 1.5 mm. long, pale brown, reticulate, the horizontally elongate cells with raised margins, the lanceolate beak equaling the achene; bristles none.

In moist forests, Costa Rica, Panama, Colombia.

CHIRIQUÍ: Río Caldera, 1650 m., *Killip 4537*; Bajo Chorro, 1900 m., *Woodson & Schery 653*.

16. *RYNCHOSPORA MACROCHAETA* Steud. in Lechler, Berberides Amer. Centr. 56. 1857.

Rynchospora Hoffmanni Boeckl. Linnaea 37:637. 1873.

Perennial, glabrous or nearly so, about 1 m. high, with short rootstocks, the culms stout, leafy; panicles of few corymbs, the spikelets numerous, 6-8 mm. long; achene obovate, 3 mm. long, smooth, pale grayish-brown, the lanceolate grayish beak longer than the achene; bristles none.

Costa Rica, Panama, South America.

CHIRIQUÍ: Casita Alta to Cerro Copete, alt. 2300-3300 m., Woodson & Schery 352.

15. *SCLERIA* Berg.

SCLERIA Bergius, Vet. Akad. Handl. 26:142. 1765.

Mostly leafy perennials, with small monoecious spikelets in terminal or axillary fascicles, or in interrupted spikes; fertile spikelets 1-flowered with several empty scales; staminate spikelets many-flowered; achene crustaceous, globose to ovoid, frequently supported on a lobed or lacinate disc (hypogynium); stamens 1-3; style 3-cleft. About 100 species, chiefly in tropics of both hemispheres.

KEY I. BASED ON HABIT

- a. Inflorescence verticillate in an interrupted spike; slender plants with leaves 1-4 mm. wide.
 - b. Inflorescence unbranched; plants rough-hairy.
 - cc. Achenes smooth 2. *S. HIRTELLA*
 - cc. Achenes reticulate 1. *S. INTERRUPTA*
 - bb. Inflorescence often branched or lowest verticels long-peduncled.
 - c. Verticels exceeded by elongate capillary bracts 4. *S. LITHOSPERMA*
 - cc. Verticels as long as bracts.
 - d. Sheaths glabrous 3. *S. PURDIEI*
 - dd. Sheaths pubescent at apex 5. *S. MICROCOCCA*
- aa. Inflorescence a coarse extensively-branched panicle.
 - b. Slender annual (?) with soft culms and roots; leaves usually 2-4 mm. wide 12. *S. SETACEA*
 - bb. Coarse perennial, with usually broader scabrous leaves.
 - c. Leaves 3-5 cm. wide; culms soft and smooth 10. *S. LATIFOLIA*
 - cc. Leaves 0.2-3 cm. wide (sometimes broader in *S. macrophylla*, which has harsh sharply angled culms).
 - d. Climbing scabrous plants with leaves 2-7 mm. wide 15. *S. SECANS*
 - dd. Non-climbing erect plants.
 - e. Inflorescence bracts long subulate 11. *S. BRACTEATA*
 - ee. Inflorescence bracts leafy or inconspicuous.
 - f. Culms retrorsely scabrous on margins 14. *S. SETULOSO-CILIATA*
 - ff. Culms smooth to slightly roughened on the margins.
 - g. Sheath-ligule pubescent at apex.
 - h. Rachis and bracts of inflorescence purplish-brown 13. *S. PTEROTA*
 - hh. Rachis and bracts dull brown to green.
 - i. Inflorescence compact; pistillate scales glossy brown. 9. *S. EGGERIANA*
 - ii. Inflorescence loose; pistillate scales dull yellow 6. *S. MICROCARPA*
 - gg. Sheath-ligule glabrous.
 - h. Ligule lanceolate; green 8. *S. MITIS*
 - hh. Ligule short-ovate; purple-margined 7. *S. MACROPHYLLA*

KEY II, BASED ON ACHENES

1. Hypogynium obscure or none. Sect. HYPOPORUM
 - a. Achene reticulate, 1-1.5 mm. long.
 - b. Reticulation shallow. 5. *S. MICROCOCCA*
 - bb. Reticulation deep, the projections almost spinose. 1. *S. INTERRUPTA*
 - aa. Achene smooth.
 - b. Achene depressed-globose, 1 mm. long. 3. *S. PURDIEI*
 - bb. Achene obovoid.
 - c. Achene 1-2 mm. long. 2. *S. HIRTELLA*
 - cc. Achene 3 mm. long. 4. *S. LITHOSPERMA*
2. Hypogynium ciliate on the margin. Sect. OPHYROSCLERIA
 - a. Cilia 0.5-1.0 mm. long, half as high as the hypogynium.
 - b. Achene 4 mm. long; the dense cilia purplish-brown. 8. *S. MITIS*
 - bb. Achene 2.5-3 mm. long; the cilia pale brown, often in a single row. 9. *S. EGGERSIANA*
 - aa. Cilia short and inconspicuous (ca. 0.1 mm. long).
 - b. Achene very large, 3.5-6 mm. long. 7. *S. MACROPHYLLA*
 - bb. Achene 2 mm. long. 6. *S. MICROCARPA*
3. Hypogynium with deeply fimbriate lobes. Sect. SCHIZOLEPIS
 - a. Achene 2-3 mm. long, usually purplish. 10. *S. LATIFOLIA*
4. Hypogynium 3-lobed, the lobes entire. Sect. EUSCLERIA
 - a. Achene reticulate.
 - b. Achene-surface with small isodiametric cells; the hypogynium acutely 3-lobed. 12. *S. SETACEA*
 - bb. Achene-surface horizontally ridged; the truncate hypogynium purple-margined. 11. *S. BRACTEATA*
 - aa. Achene smooth.
 - b. Achene white, obovate to ovoid.
 - c. Hypogynium lobes reflexed. 15. *S. SECANS*
 - cc. Hypogynium lobes crenulate and appressed. 14. *S. SETULOSO-CILIATA*
 - bb. Achenes purple to white, depressed-globose; hypogynous lobes appressed. 13. *S. PTEROTA*

1. *SCLERIA INTERRUPTA* L. C. Rich, Act. Soc. Hist. Nat. Paris 1:113. 1792.

Scleria distans var. *interrupta* Kuekenth. Rep. Sp. Nov. 23:214. 1926.

Annual, with fibrous roots; culms 15-50 cm. high, triangular, sparsely hirsute with long white hairs or rarely glabrate; leaves 5-20 cm. long, 1-2 mm. wide, pubescent, flat, linear; sheaths pubescent; inflorescence glomerate-spicate, 5-10 cm. long; spikelets 2-4 mm. long; staminate scales lanceolate; pistillate scales ovate, purplish-tinged; hypogynium none; achene sparsely rugose-verrucose or tuberculate, 1-1.5 mm. long, mucronate, trigonous, 12-porose at the attenuate base.

Savannas and lava fields, West Indies to Central America and northern South America.

CANAL ZONE: Ancón Hill, Killip 4120. PANAMÁ: Panamá, Killip 4058 (det. Core); Alhajuela, Killip 4169.

2. *SCLERIA HIRTELLA* Sw. Prodr. 19. 1788.

Pubescent perennial with slender rhizomes, the culms slender, 2-6 dm. long; leaves 2-4 mm. wide; spikes 5-20 cm. long, the spikelets hispidulous, in remote clusters; hypogynium none; achene 1-2 mm. long, obovoid to subglobose, white, smooth, shining, mucronulate, obscurely trigonous, the base cuneate-attenuate, not porose, or lightly 9- to 12-excavated.

Wet grassy lands, pine barrens and savannas, southern United States to northern Argentina and Chile; also in Africa.

CHIRIQUÍ: El Boquete, *Hitchcock* 8325. PANAMÁ: Las Sabanas, *Killip* 4055a.

3. *SCLERIA PURDIEI* C. B. Clarke, *Kew Bull. Add. Ser.* 8:57. 1908.

Scleria Hitchcockii Standl. *Contrib. U. S. Nat. Herb.* 18:88. 1916.

Plants slender, 5–7 dm. high; leaves 12–18 cm. long, 2–4 mm. wide, nearly glabrous; panicles about 10 cm. long, the branches very slender; spikelets sessile, in small dense clusters; hypogynium none; achene smooth, shining, depressed-globose, 1 mm. long, white, shorter than the scales.

Savannas and woodlands, Panamá to Colombia and Venezuela.

CHIRIQUÍ: El Boquete, *Hitchcock* 8326.

4. *SCLERIA LITHOSPERMA* (L.) Sw. *Prodr.* 18. 1788.

Scirpus lithospermus L. *Sp. Pl.* 51. 1753.

Plants glabrous or nearly so, with stout rootstocks, the culms 3–9 dm. long; leaves 10–30 cm. long, 1–3 mm. wide; inflorescence sparsely branched, the spikelets in distant sessile clusters; hypogynium none; achene 3 mm. long, white, smooth, shining, oblong or ovate-elliptic, subacuminate, the attenuate trigonous base non-porose.

Dry thickets and open woods, especially on limestone, in nearly all tropical maritime regions.

CANAL ZONE: Ancón Hill, *Hitchcock* 8324.

5. *SCLERIA MICROCOCCA* (Liebm.) Steud. *Syn. Cyp.* 179. 1855.

Hypoporum micrococcum Liebm. *Dansk. Vid. Selsk. Skr. V.* 2:255. 1851.

Scleria Liebmanni Steud. *op. cit.* 179.

Scleria costaricensis Boeckl. *Allg. Bot. Zeitschr.* 2:157. 1896.

Plants annual, pubescent below, very slender, the culms 20–30 cm. long; leaves 2 mm. wide; inflorescence about 10 cm. long, the spikelets in small sessile clusters, the bracts shorter than the spikelets; hypogynium none; achene 1 mm. long, fenestrate-verrucose, white, shining apiculate, globose, shorter than the scales, the base trigonous, attenuate, 5-porose on each face.

Wet fields, Mexico to northern Brazil; also in Cuba.

CANAL ZONE: Ancón Hill, *Standley* 25214. PANAMÁ: Las Sabanas, *Killip* 4055.

6. *SCLERIA MICROCARPA* Nees, *Linnaea* 9:302. 1834.

Plants stout, with horizontal rhizomes, about 1 m. high; leaves 20–30 cm. long, 8–11 mm. wide, the sheaths narrowly 3-winged; panicles narrow, 20–50 cm. long; hypogynium-margin more or less densely white-ciliate or ciliolate; achene 1–2 mm. long, exceeding the scales, ellipsoid-ovoid, smooth, white, shining, tipped by the more or less persistent style-base.

Swamps, roadsides, and moist thickets, Cuba and Guatemala to Paraguay.

COLÓN: Río Sirrí, *Pittier* 4022.

7. *SCLERIA MACROPHYLLA* Presl, *Rel. Haenk.* 1:200. 1828.

Opbryoscleria asperima Liebm. *Dansk. Vid. Selsk. Skr. V.* 2:261. 1851.

Perennial by stout rhizomes; culms coarse, smooth, or the angles sometimes scabrous, sharply triangular, 1-3 m. high; leaves linear-lanceolate, 5- to 7-nerved, rigid, attenuate-acuminate, 2-4 dm. long, 1-4.5 cm. wide, smooth or somewhat roughened on the margins and veins beneath; inflorescence paniculate, terminal and axillary; hypogynium large, undulately 3-lobed, the margin more or less ciliate; achene subglobose-ellipsoid, white or discolored, smooth, shining, 3.5-6 mm. long, tipped with the somewhat persistent conic pale style-base.

Marshes and swampy forests, Mexico to Brazil and Bolivia.

CANAL ZONE: Summit, *Standley 30060*; Darién Station, *Standley 31643* (immature and questionable). PANAMÁ: Juan Díaz, *Standley 30475*; Isthmus of Panama, *Fendler 360*; between Panamá and Chepo, *Dodge, Hunter, Steyermark & Allen 16670*.

8. *SCLERIA MITIS* Berg. Vet. Akad. Handl. Stockh. 26:145. 1765.

Plants stout and coarse, 1-2 m. high, nearly glabrous; leaves 30-50 cm. long, the sheaths 3-winged; panicles narrow, 50 cm. long or less, much branched; hypogynium truncate, densely fringed with brown or red-brown hairs; achenes ellipsoid, 4 mm. long, smooth, white, sometimes black or discolored, lustrous, tipped with the small conic black persistent style-base.

Clearings and wet banks, Guatemala and Cuba to Paraguay and Bolivia.

BOCAS DEL TORO: Old Bank Island, Chiriquí Lagoon, *von Wedel 1972*. CANAL ZONE: Victoria Fill, near Miraflores Locks, *Allen 1731*; Las Cruces, *Pittier 2616a*; Empire to Mandinga, *Piper 5497*; Gatún, *Hayes*, in 1860; Fort Randolph, *Maxon & Harvey 6515*; Chagres, *Fendler 359*. PANAMÁ: Pacora, *Killip 4322*.

9. *SCLERIA EGGERSIANA* Boeckl. Cyp. Nov. 2:41. 1890.

Scleria Grisebachii C. B. Clarke, Symb. Ant. 2:150. 1900.

Rhizome horizontal, thick, woody; culms coarse, 1-2 m. tall, triangular, erect, nearly smooth; leaves 30 cm. long or longer, 1-2.5 cm. wide, scabrous, especially on the veins and margins, coriaceous, rigid, flat or somewhat plicate; sheaths 3-winged, scabrous on the angles, otherwise glabrous; inflorescence paniculate, narrow, about 3 dm. long; hypogynium-margin densely brown-ciliate, cup-shaped, 3-lobed; achene 2.5-3 mm. long (with high hypogynium 4 mm. long), white, globose or subglobose, shining, smooth, terminated by the conic, pale, more or less deciduous style-base.

West Indies, Central America, and northern South America.

CANAL ZONE: Fort Randolph, *Standley 28730*; Barro Colorado Island, *Kenoyer 144*; between France Field and Catival, *Standley 30281*.

10. *SCLERIA LATIFOLIA* Sw. Prodr. 18. 1788.

Scleria arundinacea Kunth, Enum. 2:347. 1837.

Plants stout, 1 m. high or more; leaves 40-60 cm. long, 3-5 cm. wide, the sheaths broadly 3-



Fig. 38
Scleria latifolia

winged; panicles 40 cm. long or less; hypogynium 3-lobed, the lobes deeply fimbriate, the fimbriations brown or purplish; achene depressed-globose, white or purplish, smooth, 2-3 mm. long.

Moist shady places, Central America and the Lesser Antilles to Bolivia.

COCLÉ: El Valle, *Allen 209*. PANAMÁ: Campana, alt. 600-800 m., *Allen 1316*. DARIÉN: Cana-Cuasi Trail, Chepigana, 4500 ft., *Terry & Terry 1509*.

11. *SCLERIA BRACTEATA* Cav. Icon. 5:34. pl. 451. 1799.

Plants coarse, about 1 m. high, with stout rhizomes, copiously pubescent; leaves about 1 cm. wide, with very scabrous margins, the sheaths scarcely winged; panicles axillary and terminal, the upper ones staminate, usually brownish, conspicuously bracteate; hypogynium 3-lobed, the lobes rotund, with a dark purple margin, entire or sometimes dentate; achene discolored or usually white, 2-3 mm. long, subglobose, apiculate-verrucose or subtuberculate, pubescent, at least on the tubercles.

Moist thickets and borders of forests, Mexico and West Indies to Paraguay and Bolivia.

CANAL ZONE: Balboa, *Standley 25523*; Ancón Hill, *Piper 5544*; *Standley 26331*; *Killip 4069*; Summit, *Standley 26957*; Corozal, *Standley 29047*. PANAMÁ: Río Tapia, *Standley 28173*; Taboga Island, *Standley 28012*; G. S. Miller 2020; *Pittier 3615*; *Macbride 2829*; *Allen 113*.

12. *SCLERIA SETACEA* Poir. in Lam. Encycl. 7:4. 1806.

Scleria coriacea Liebm. Dansk. Vid. Selsk. V. 2:259. 1851.

Plants with fibrous roots, glabrous or nearly so, 30-60 cm. high, slender; leaves 1-4 mm. wide, the sheaths very narrowly winged; panicles small, axillary, with elongate bracts; hypogynium deeply 3-lobed, the lobes ovate-lanceolate, subacute, appressed; achene 2 mm. long, more or less reticulate, the transverse ridges pilose, sordid white, globose-elliptic, the ridges somewhat spirally arranged.

Pine barrens and low meadows, New York and Indiana to Florida and Texas; also in the West Indies, Central America and northern South America.

PANAMÁ: Matías Hernández, *Standley 32023*, 28857; Río Tecúmen, *Standley 26709*.

13. *SCLERIA PTEROTA* Presl in Oken, Isis 21:268. 1828.

Scleria pratensis Nees in Mart. Fl. Bras. 2¹:179. 1842.

Scleria melaleuca Schlecht. & Cham. Linnaea 6:29. 1831.

Scleria Pittieri Boeckl. Allg. Bot. Zeitschr. 2:159. 1896.

Plants with short rhizomes, 30-80 cm. high, rather stout, nearly glabrous; leaves 30 cm. long and 1 cm. wide or narrower; panicles axillary, small, sparsely branched, green or brownish, the bracts inconspicuous; hypogynium depressed, 3-lobed, the lobes broad, rounded, ciliate or glabrous; achene 1.5-2.5 mm. long, smooth, white to purplish, depressed-globose or sometimes pointed, apex subumbonate.

In boggy meadows and wet clearings throughout the West Indies and continental tropical America; common.

CANAL ZONE: Miraflores Lake, *G. White 184*; Ancón Hill, *Woodson, Allen & Seibert 1326*; between Peluca Hydrographic Station and Quebrada Peluca, along Río Boqueron,

70- m., Steyermark & Allen 17246; Balboa, Standley 25299; Gamboa, Standley 28432; Corozal, Standley 29180, 27340. PANAMÁ: east of Pacora, ca. 25 m., Woodson, Allen & Seibert 747; Taboga Island, Woodson, Allen & Seibert 1541; Standley 28029; Pittier 3588; Old Panamá, Killip 4061; Juan Díaz, Killip 4047; Matias Hernández, Killip 6795. DARIÉN: Marraganti, Williams 1035.

SCLERIA PTEROTA var. *MELALEUCA* Uittien, Fl. Surinam. 1:140. 1934.

Variant with blackish achenes.

BOCAS DEL TORO: Almirante, Cooper 125; Changuinola Valley, Dunlap 204; Laguna de Chiriquí, Hart 85. CHIRIQUÍ: David, Hitchcock 8371. CANAL ZONE: Tabernilla, Hitchcock 8113; Cerro Gordo, near Culebra, Pittier 3734; Río Grande, near Culebra, Pittier 2122; Darién Station, Standley 31651; Frijoles, Piper 5809; Killip 4287; Barro Colorado Island, Standley 40833; Summit, Standley 29609; Fort Randolph, Standley 28706. PANAMÁ: Chepo, Pittier 4718; Río Tecúmen, Standley 26700, 26570; Bella Vista, Standley 25311; Isthmus of Panama, Fendler 358; Las Sabanas, Bro. Paul 88; Arraiján, ca. 15 m., Woodson, Allen & Seibert 1341. DARIÉN: near mouth of Río Yapé, ca. 20 m., Allen 361.

14. *SCLERIA SETULOSO-CILIATA* Boeckl. Flora 65:30. 1882.

Plants stout, 0.5–1 m. high, tufted; leaves about 1 cm. wide, scabrous on the margins, the sheaths narrowly winged; panicles small, dense, with elongate bracts; hypogynium 3-lobed, the lobes appressed, rotund, the margins crenulate, white, the base dark-lined; achene 3–4 mm. long, ovoid, white, smooth, shining, mucronate.

Moist places and cultivated fields, Cuba and Mexico to Brazil.

CANAL ZONE: Summit, Standley 26936. DARIÉN: El Real, Allen 962.

15. *SCLERIA SECANS* (L.) Urban, Symb. Antill. 2:169. 1900.

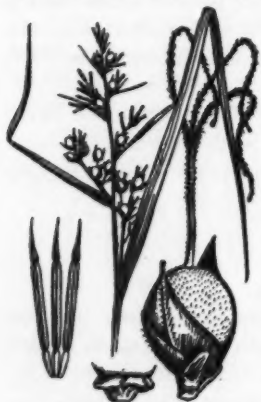


Fig. 39
Scleria secans

Schoenus secans L. Syst. Nat. ed. 10. 865. 1759.

Scleria reflexa HBK. Nov. Gen. & Sp. 1:232. 1816.

Plants perennial, the culms long and weak, often reclining on shrubs or scandent to a height of 3 m. or more; leaves 2–7 mm. wide, stiff, very scabrous on the margins; panicles small, terminal and axillary, conspicuously bracteate, purplish or castaneous; hypogynium flat, subentire, the margin reflexed, undulate; achene 2–4 mm. long, globose-ovoid, white, smooth, shining, usually minutely white-pubescent, as long as the scales or nearly so.

Wet thickets and savannas, West Indies and Mexico to Bolivia.

CHIRIQUÍ: Río Dupí, near sea level, Pittier 5245. PANAMÁ: Taboga Island, Pittier 3616; Trapiche Island, Pearl Islands, 0–15 m., Allen 2626.

16. *CALYPTROCARYA* Nees

CALYPTROCARYA Nees in Linnaea 9:304. 1834.

Leaves long, linear; spikelets in small globular heads; achene biconvex, apicu-

late, style 2-fid; pistillate flowers with 2 distichous glumes and 2-4 staminate flowers at base. About 5 species, of tropical America.

1. *CALYPTROCARYA GLOMERULATA* (Brongn.) Urban, Symb. Antill. 2:169. 1900.

Becquerelia Glomerulata Brongn. in Duperrey, Voy. Coquille 2:163. 1829.

Calyptrocarya fragifera Kunth, Enum. 2:364. 1837.

Calyptrocarya Palmetto Nees in Mart. Fl. Bras. 2^a:195. 1842.



Fig. 40
Calyptrocarya glomerulata

Leafy perennial, with short thick rootstocks; culms 1.5-6 dm. high; leaves glabrous except for the scabrous margins, linear, 2-9 mm. wide, 3-nerved, usually longer than the culms; spikelets in glomerules on rays of compound or simple axillary corymbs; pistillate spikelet terminal, 1-flowered, without bristles, the staminate spikelets lateral, 1- to 4-flowered; stamen 1; style bifid; achene brownish, globose, puberulent, about 1 mm. long.

Occasional in forests or swamps, Central America to Brazil.

BOCAS DEL TORO: Old Bank Island, Chiriquí Lagoon, von Wedel 2030. COLÓN: Fató, Pittier 3850. CANAL ZONE: headwaters of Río Chinilla, Maxon 6893; Chagres, Fendler 357; Colón, O. Kuntze 1848. PANAMÁ: Juan Díaz, Killip 4072.



Fig. 41
Hypolytrum Schraderianum

17. *HYPOLYTRUM* L. C. Rich

HYPOLYTRUM L. C. Rich in Pers. Syn. 1:70. 1805.

Inflorescence a head, spike, or corymb; flowers with 2 or more stamens; scales 2 or more, 2 of them often connate; style 2-fid. A genus of about 50 species in the tropics of both hemispheres, closely resembling *Mapania*.

1. *HYPOLYTRUM SCHRADERIANUM* Nees in Mart. Fl. Bras. 2^a:65. t. 5. 1842; Svenson, Proc. Calif. Acad. Sci. IV. 22:191. 1939.

Hypolytrum nicaraguense Liebm. Dansk. Vid. Selsk. Skr. 2:235. 1851.

Leafy perennial, about 1 m. high, with stout triangular culms; leaves linear, 2-3 cm. wide, with scabrous margins; inflorescence corymbose-paniculate, many-flowered, sometimes nearly 2 dm. long; spikelets glomerulate on peduncles about 5 mm. long; inner scales (perianth) 2, with scabrous keels, stamens 2; style bifid; achene ovoid, 2.5 mm. long, corky, with variable raised nervation on the surface.

In forests, Central America to Brazil.

CANAL ZONE: Fort Randolph, Maxon & Harvey 6538; Standley 28668; Chagres, Fendler 356.

18. MAPANIA Aubl.

MAPANIA Aubl. Pl. Guian. 1:47. *t.* 17. 1775.

Large coarse glabrous perennials; spikelets in a single terminal head with a 3-leaved involucre; spikelets of 6 scales, the 2 lower sterile, the 3 above these staminate, the uppermost pistillate; style 2- to 3-cleft. About 45 species, in the tropics of both hemispheres.

1. MAPANIA SYLVATICA Aubl. Pl. Guian. 1:47. *t.* 17. 1775.

Culms 15-60 dm. high, leafless except for the involucre bracts; bracts 3, 8-14 cm. long and 2-6 cm. wide; spikes 1-2 cm. long, in a sessile head, ferruginous; style trifid; achene subglobose.



Fig. 42. *Mapania sylvatica*

In forests, Costa Rica to French and British Guiana, and Venezuela. Also cited by Standley.

DARIÉN: Cana-Cuasi Trail, near divide, Chepigana, rain forest at 5000 ft., Terry & Terry 1515.

19. UNCINIA Pers.

UNCINIA Pers. Syn. 2:534. 1807.

Perennials, the culms erect, leafy below; flowers unisexual, spicate; bracts 2,

connate and forming a bicarinate utricle, this enclosing the ovary; a rudiment of a spikelet present in the utricle, setiform, the apex exserted and uncinat. About 25 species, chiefly in the South Temperate Zone.

1. *UNCINIA HAMATA* (Sw.) Urban, Symb. Antill. 2:169. 1900.

Carex hamata Sw. Prodr. 18. 1788.

Uncinia jamaicensis Pers. Syn. 2:534. 1807.

Uncinia mexicana Steud. Syn. Cyp. 243. 1855.

Forming dense clumps 30–60 cm. high; leaves 2–7 mm. wide; culms bearing a single spike, 8–15 cm. long; utricles lanceolate; style 3-cleft; bristle more than twice as long as the utricle.

Southern Mexico and West Indies to southern Brazil and northern Argentina.

CHIRIQUÍ: Río Chiriquí Viejo valley, near El Volcán, P. White 226; Potrero Muleto to summit, Volcán de Chiriquí, alt. 3500–4000 m., Woodson & Schery 458; Hitchcock 8203; Cerro de la Horqueta, Pittier 3199; El Boquete, Maxon 5589.

20. CAREX L.

CAREX L. Sp. Pl. 972. 1753; Kuekenenthal Pflanzenr. IV²⁰:67–767. 1909; Mackenzie, N. Am. Fl. 18^o:1–478. 1931–35, and N. Am. Caricaceae, 539 pl. 1940.

A genus of more than 1000 species, chiefly in temperate and arctic regions.

- | | |
|---|-----------------------|
| a. Perigynia biconvex; stigmas 2 | 1. C. LEMANNIANA |
| aa. Perigynia trigonous; stigmas 3. | |
| b. Perigynia green or yellowish; straight. | |
| c. Perigynia 2.5–4 mm. long; achenes 1.5–2 mm. long | 2. C. POLYSTACHYA |
| cc. Perigynia 4.5–5 mm. long; achenes 3 mm. long | 3. C. HUMBOLDTIANA |
| bb. Perigynia purplish, strongly curved | 4. C. DONNELL-SMITHII |

All the specimens seen by me from Panama have a paniculate inflorescence, though in *C. polystachya* the panicle may be greatly reduced.

1. *CAREX LEMANNIANA* Boott, Trans. Linn. Soc. 20:121. 1846; Mackenzie, op. cit. t. 396. 1940.

Carex Lemanniana var. *simplex* Kuekenenth. op. cit. p. 405.

Culms 25–60 cm. high, brownish at the base; leaves numerous, clustered near the base, the leaf blades 2.5–8 mm. wide, glaucous, coriaceous, stiff, long-attenuate; inflorescence not or but sparingly compound, the spikes usually 4–10, androgynous, linear-cylindric, 2–6 cm. long, 3.5–5 mm. wide, the pistillate part 20- to 40-flowered; scales lance-ovate, usually rough-awned, purplish-black; perigynia oblong-ovate, 2.5 mm. long, 1 mm. wide, membranaceous, plano-convex, straw-colored and strongly purplish-splashed, obscurely striate ventrally, finely several-nerved dorsally, serrulate above, rounded at the base, abruptly beaked, the beak straight, 0.5 mm. long, bidentate, the teeth short, scabrous within.

Damp places in mountains, Costa Rica to Colombia and Ecuador. On Chiriquí Volcano, where it forms dense tussocks.

CHIRIQUÍ: Potrero Muleto to summit, Volcán de Chiriquí, alt. 3500–4000 m., Wood-

son & Schery 404; Loma Larga to summit, Volcán de Chiriquí, ca. 2500–3380 m., Woodson, Allen & Seibert 1057.



Fig. 43
Carex polystachya

2. *CAREX POLYSTACHYA* Sw. ex Wahl. Kongl. Vet. Akad. Handl. 24:149. 1803; Mackenzie, op. cit. t. 265. 1940.

Carex cladostachya Wahl. op. cit. 1803.

Carex mexicana Presl, Rel. Haenk. 1:204. 1828.

Carex Hartwegii Boott ex Benth. Pl. Hartw. 96. 1848.

Carex acrolepis Liebm. Dansk. Vid. Selsk. Skr. II. 5:270. 1851.

Carex Oerstedii Liebm. op. cit. 272. 1851.

Rootstocks woody; culms 25–60 cm. high; leaves numerous, clustered towards the base, the leaf blades thick, stiff, light green, long-attenuate, very rough, 2–7 mm. wide; spikes very many, in decompound panicles, androgynous, 5–9 mm. long, 3–4 mm. wide; scales ovate, many-striate, cuspidate to acute; perigynia narrowly obovoid, sharply triangular, not inflated, bright green, 2-keeled and many-nerved, stipitate, abruptly beaked, the beak strongly bidentate, half the length of the body or less.

Dry woodlands in mountains, West Indies and Mexico, southward to Peru. The inflorescence in Panama specimens is often much reduced (see fig 43).

CHIRIQÚ: El Boquete, Hitchcock 8327; Chiriquí Volcano, Hitchcock in 1911. COCLÉ: El Valle, 600–1000 m., Allen 747, 1169.

3. *CAREX HUMBERTIANA* Steud. Syn. Cyp. 208. 1855; Mackenzie, op. cit. t. 264. 1940.

Carex polystachya Sw. sensu Kuekenh. in Pflanzenr. IV²⁰:267. 1909.

Carex macrosperma Mackenzie, Bull. Torrey Club 36:477. 1909.

Rootstocks woody; culms 60–100 cm. high; leaves numerous, clustered towards the base, the leaf blades thick, stiff, light green, long-attenuate, 2.5–6 mm. wide; spikes very many, in 6–10 erect peduncled panicles, androgynous, 5–10 mm. long, 4–6 mm. wide; scales ovate, many-striate, short-awned to obtuse; perigynia elliptic-obovoid, sharply triangular, not inflated, bright green, 2-keeled and obscurely nerved, stipitate, abruptly beaked, the beak shallowly bidentate, half the length of the body or less.

Dry woodlands in mountains, Mexico to Brazil.

CHIRIQÚ: Chiriquí Volcano, Hitchcock 8204.

4. *CAREX DONNELL-SMITHII* Bailey, Mem. Torrey Club 1:56. 1889; Mackenzie, op. cit. t. 305. 1940.

Carex Pittieri Boeckl. Allg. Bot. Zeitschr. 2:190. 1896.

Culms stout, 30–100 cm. high, purplish at the base; leaves numerous, the lower clustered, the leaf blades 3–10 mm. wide, glabrous, coriaceous, stiff, long-attenuate; inflorescence compound, 20–60 cm. long, the lower branches in 2's or 4's, the upper simple; spikes numerous, androgynous, narrowly linear-cylindric,

3-12 cm. long, 3.5-5 mm. wide, the pistillate part rather loosely 20- to 50-flowered; scales lance-ovate, usually rough-awned, purplish-black; perigynia lanceolate, 3.5-4 mm. long, membranaceous, dull green, scarcely inflated, punctulate, 2-ribbed and strongly few-nerved, short-stipitate, abruptly beaked, the beak excurved, 1-1.5 mm. long, bidentate, the teeth stiffish, scabrous within.

In thickets, forest, or sphagnum bogs in mountains; Guatemala, Honduras, Costa Rica, Panama.

CHIRIQUÍ: El Boquete, Killip 4528, 4546; Davidson 1044; Chiriquí Volcano, Hitchcock 8212; Bajo Chorro, Davidson 146.

EXPLANATION OF PLATE

PLATE 1

Fig. 1. *Cyperus tenuis*, showing an average small specimen (Killip 4164) and a mature spikelet and achene (1a) of *C. hermaphroditus* (Killip 4540).

Fig. 2. *Cyperus tenuis*, a variant with somewhat reflexed spikelets (Killip 4156).

Fig. 3. *Cyperus ferax*, the large phase common in Panama, often with rachis-wings becoming corky only at late maturity, (Woodson, Allen & Seibert 1571).

Fig. 4. *Rynchospora robusta* (Woodson 742).

Fig. 5. *Lipocarpus Sellowiana* (Woodson & Schery 747), showing a spikelet with the two inrolled inner scales removed from the achene and stamens, which are shown against the inner face of the subtending scale. Below, the position of these three scales is shown in diagrammatic cross-section of the spikelet.



CYPERACEAE OF PANAMA



PALMACEAE

By L. H. BAILEY

Woody perennial endogenous bland trees, shrubs and climbing vines (sometimes almost herbaceous), possessed of distinguished peculiarities and commonly recognized as a separate major botanical family yet lacking definite taxonomic morphological characters that pertain in all the species. The most characteristic general feature is the foliage: leaf-blades palmate and variously segmented, or elongated and pinnately veined or pinnatisect or pinnate, the leaf itself not long persistent and durable as in the cycads: blossoms very small, chaffy or soon becoming so, the envelopes in two series of calyx and corolla or simulating those organs, the parts or lobes valvate or imbricate in the bud, the stamiferous buds opening only briefly on disclosing the stamens and the flower then falling, pistilliferous buds exposing stigmas only a few hours: flowers hermaphrodite or unisexual, in the latter case the plant monoecious or dioecious, borne either on a simple spike-like spadix or in variously branched spadices or clusters always accompanied by more or less expanded scarious or foliaceous bracts or spathes; spadices usually interfoliar or infrafoliar, seldom in Old World species superfoliar and forming a top above the leaf-crown or coma; stamens prevailing 6, as are the sepals and petals or lobes of the calyx and corolla, but sometimes 3, frequently many, anthers various; ovary superior, commonly 3-loculed and 3-ovuled but usually only 1 ovule developing; staminodia and pistillodia often present in flowers of the alternate sex: fruit little to very large, commonly 1-seeded and variously drupe-like, micropylar pore often marked on the exterior and in the *Cocos* tribes the two pores of the aborted locules also persisting and prominent, exterior fleshy and plum-like or fibrous or even coriaceous or parchment-like; seed ordinarily included in a shell-like mesocarp which is sometimes very thick and hard, often covered with extensive and involved branches of the raphe; seed content a soft or liquid substance that in most cases hardens into an endosperm, in which case the content may be ruminated by intrusions of a darker tissue from the walls, or the albumen homogeneous; embryo basal, lateral, apical, the placement usually characteristic of the genus.

A few thousand species of noble plants in many genera, growing around the world in tropical and warm temperate regions, some of them withstanding frost, inhabiting humid, intermediate and semi-arid places, in swamps, on plains and mountains and dry exposed savannas. Many of the species of the western hemisphere are imperfectly understood, and undoubtedly many novelties yet await discovery. Palms yield extensive materials for thatch, building timber, vegetable ivory, oils, fiber, and nutritious edible fruits or nuts as in the date, coconut, pejibaye. In warm countries they are extensively planted for ornament and comfort, yet frequently arranged and treated in poor taste.

TERMS SPECIALLY EMPLOYED IN PALM DIAGNOSES

- acervulus** (Latin, a little heap). Applied particularly in the palms to thin lines of flowers and fruits on a rachilla, pistillate flowers being at one end of the line; well represented in *Synechanthus*, *Gaussia*, *Mascarena*.
- coma** (Latin, the hair, head of hair). The leafy crown or head of a palm tree, particularly when the top is more or less condensed and high above the ground as in *Acrocomia*, *Euterpe*, *Roystonea*.
- continuous**. Said of albumen that is both solid (or without central cavity) and not ruminant.
- costapalmate**. Leaf-blade of the fan-shape or palmate kind that has a midrib and some of the segments divided to it, as in most species of *Sabal*.
- crownshaft**. The conspicuous elongated smooth false part of the shaft or trunk, composed of leaf-bases and inclosed terminal bud, that stands between the spadices and the coma in some palms, as in *Roystonea*, *Euterpe*, *Oenocarpus*. The spadices at its base stand in the axils of fallen leaves.
- cymba** (Latin, a boat). A spathe-valve that is heavy, woody and durable, and concave so that it incloses or accompanies the inflorescence and then the infructescence, applied particularly to the main secondary valve that remains on the tree, the primary or shorter cymba being early caducous, as in *Acrocomia*, *Cocos*, *Scheelea*.
- endocarp**. The inner layer or part of a pericarp; applied in palms to the osseous case in which the seed is often borne, when the case is not of the seed itself.
- equable**. Said of non-ruminant albumen: plane; homogeneous.
- bascula**. The ligule at apex of petiole of palmate leaves, at the base of blade.
- homogeneous**. Uniform, of the same kind throughout; said of non-ruminant albumen: plane.
- infracoliar**. Below the leaves; applied to spadices that arise beneath the coma or leaf-crown.
- interfoliar**. Among the leaves; said of spadices that arise within the leaf-crown or among the leaves.
- mesocarp**. The middle part of a pericarp; applied to the content, usually soft, mucilaginous or fibrous, that lies between the endocarp and the nutlet; probably it represents different morphological structures.
- nodisfrond**. The bract attending a flower-branch at each node of the spadix, applicable particularly in those spadices (as in *Sabal*) not accompanied by a cymba; sometimes called a spathelet.
- nutlet**. The hard nut-like center of the fruit, either the real seed itself or that body with its inseparable hard attached shell without reference to its derivation.
- palman**. The undivided part, like the palm of the hand, of a fan-shaped leaf, important in the diagnosis of certain species of *Sabal*, and designative in other palmate blades.
- plane**. Said of albumen when it is not ruminant.
- rachilla**. Ultimate branch of a compound spadix, on which the flowers and fruits are borne; less frequently applied to the axis of a simple spadix.
- ruminant**. Applied to albumen that is invaded by dark-colored protrusions from the walls, so that it is not homogeneous. The ruminant structure or its absence is an important diagnostic character.
- sarcocarp**. In a fruit, the external part or layer of soft or succulent substance, independently of its morphological origin.
- spadix**. The flowering and fruiting organ in a palm, whether simple or compound, fleshy or hard: inflorescence. This use of the term is often unfortunate even if supported by custom.
- spathe**. Large specialized bract associated with a spadix, particularly when expanded and apparently having structural relation to the flower-cluster. In practice with palms the term covers all the bracts and leafy organs subtending a spadix, even though this is a loose application of the word and will be corrected when good morphological investigations of the organs shall have been made. A *spathelet* subtends a branch of a spadix or inflorescence. In the cymba-like spathes the parts or *valves* are ordinarily

2, the primary or outer one falling usually in advance of flowering and infrequently observed, the inner longer and more durable one that commonly at first completely incloses the spadix or cluster: see *nodifrond*, *cymba*, *superfoliar*. Above the leaves; said of spadices that are terminal, or arise above the crown, as in *Corypha*, an Old World palm sometimes planted; apparently none of the American palms presents this structure.

- a. Leaves palmate or fan-shaped.
- b. Petiole ending at leaf-blade; trunk bearing thorns..... 1. *CAYOSOPHILA*
- bb. Petiole extending nearly or quite through the blade as a midrib (at least in ours) and the blade with a marked downward curve in consequence: trunk not armed..... 2. *SABAL*
- aa. Leaves of the plumose kind with a continuing central rachis, pinnately veined or pinnatisect or pinnate.
- b. Fruit a large hard tuberculate rough shell lacking evident carpellary structure at maturity, inside which 1-9 large nutlets are borne.
- c. Species monoecious, both sexes on one spadix: spathe a woven cloth-like sheath that tears open at anthesis: fruits tessellate with small tubercle-like elevations..... 27. *MANICARIA*
- cc. Species dioecious: staminate flowers in dense catkins with 2 cymba-like spathe-valves: fruits in strongly tubercled very large heads; seeds yielding vegetable ivory..... 28. *PHYTELEPHAS*
- bb. Fruit wholly otherwise, smooth or only weakly spinescent or strigose, calyx and stigmatic point and usually the micropyle apparent on outside or on the seed.
- c. Exterior of fruit loricate, completely covered in thin flattened imbricate smooth glossy scales..... 26. *RAPHIA*
- cc. Exterior of fruit not loricate: fruit for the most part drupe-like even though the exterior is fibrous.
- d. Trunk or caudex long and very slender, not self-supporting, the plant a clambering or climbing vine..... 6. *DESMONCUS*
- dd. Trunk heavy, essentially erect even if sometimes horizontal at base: trees or shrubs.
- e. Nutlet with 3 prominent pores or eyes (micropyles) at basal end underneath the fibrous covering; crownshaft not developed: spadices interfoliar (except in *Scheelea* and *Acrocomia*), branched (in ours); spathe usually of 2 woody cymbas (except in *Corozo* and perhaps *Aiphanes*), one of which persists and covers the inflorescence.
- f. Plant unarmed (except for spine-like undeveloped pinnae on lower part of rachis).
- g. Mature fruit very large, outer covering a thick spongy husk, nutlet containing liquid..... 3. *COCOS*
- gg. Mature fruit size of goose egg or smaller, outer covering a close thin hard husk or integument.
- h. Spadix long and much branched, inside a heavy woody cymba: erect tree..... 4. *SCHEELEA*
- hh. Spadix a dense head in axils, with fibrous shreddy covering: trunk prostrate at base..... 5. *COROZO*
- ff. Plant armed with spines or prickles on trunk, petioles, cymbas or other parts.
- g. Pinnae long-tapering, acuminate, pointed.
- h. Trees large and heavy, boles usually variously tumid: main or permanent cymba elongated, very large and woody: staminate flowers somewhat or manifestly sunken in rachilla..... 7. *ACROCOMIA*
- hh. Trees small with slender often flexuose trunks that are not swollen, frequently soboliferous or coloniate: cymba short, often nearly as broad as long at maturity, not woody: staminate flowers not sunken..... 8. *BACTRIS*
- gg. Pinnae truncate or erose or strongly oblique at apex.
- h. Spathe-valves cymba-like, much elongated: staminate flowers compacted on short rachillae and sunken: heavy trees..... 9. *ASTROCARYUM*

- hh. Spathe-valves thin and narrow, not cymba-like or prominent: staminate flowers scattered on rachilla, not immersed: light slender trees.....10. AIPHANES
- ee. Nutlet or seed with only 1 pore or micropyle developed, and even this one often covered under the epidermis: crownshaft often prominent: spadices interfoliar or infrafoliar, simple or branched: spathe various, in most cases not cymba-like.
- f. Plant dioecious: rachillae marked with simple rather than triplicate scars where flowers or fruits have been: spadices vaginate, soon shredding and when fallen leaving rings on the peduncle: shrubs or very small trees.....11. CHAMAEDOREA
- ff. Plant monoecious, both sexes in same spadix: rachillae marked with 3 contiguous scars where flowers have been, pistillate depression in the center, or with 2 scars when one of the staminate has not developed: spathes not shredding: stature various.
- g. Leaves regularly pinnate; pinnae uniform, narrow long-acuminate, divaricate from the rachis.
- h. Flowers (and fruits) on branched spadices.
- i. Tree attaining great height; trunk columnar, swollen at some part of its length: main cymba several feet in length, produced into a long beak: crownshaft very prominent: albumen plane: fruit a small more or less fleshy drupe.....12. ROYSTONEA
- ii. Tree of medium height (except in *Welfia* and *Euterpe*) and size or even small; trunk not swollen: cymba short, or spathe-valves bract-like: crownshaft evident or not: fruit and albumen various.
- j. Rachillae drooping, not prominently expanded at base (at point of attachment).
- k. Blossoms sunken partially or deeply on rachis.
1. Flower-strands or rachillae thick, stout and strongly angled, the flowers in 8 or more definite rows or lines: fruit ellipsoid: albumen plane: crownshaft not developed.....13. WELFIA
- II. Flower-strands or rachillae very slender, not angled or cornered nor the pits in definite rows: fruit globose: albumen either plane or ruminant: crownshaft evident.....14. EUTERPE
- kk. Blossoms not sunken on slender more or less zigzag rachillae: fruit globose: albumen plane: crownshaft prominent.....15. OENOCARPUS
- jj. Rachillae divaricate or ascending, markedly expanded at base: albumen ruminant: crownshaft not developed.....16. PRAETOEIA
- hh. Flowers (and fruits) on simple spike-like spadices, continuing the line or direction of the peduncle: small palms.
- i. Anthers sagittate, the 2 cells not disjoined: filaments free: spadix with a chaffy appearance due to long not sunken imbricate flowers.....17. WOODSONIA
- ii. Anthers imperfectly sagittate but the 2 cells separated on opposite sides of a continuing and projected connective: filaments connate at base: flowers sunken.....18. NEONICHOLSONIA
- gg. Leaves imperfectly or irregularly pinnate but the pinnae (if any) of different widths and sizes and ascending from the rachis as if divisions of a simple blade; or, the blade pinnatisect or entire with bifid apex; or, the blade or its lobes or divisions with oblique, truncate or erose ends.
- h. Leaf divisions acuminate-pointed.
- i. Inflorescence a small often overlooked broom-like spadix with very slender rachillae on the surface of

- which the minute flowers are arranged in short lines or acervuli.....19. SYNECHANTHUS
- ii. Inflorescence various but different from above and flowers not in acervuli.
- j. Staminate buds at anthesis long and slender, not sunken in rachis.....20. HYOSPATHE
- jj. Staminate buds short, sunken in rachis.
- k. Anther-cells disjoined, separated by slender connective and spreading from points on a cup-like filament tube: leaves simple and bilobed or variously pinnatisect or irregularly pinnate: spadix simple or branched.....21. GEONOMA
- kk. Anther-cells disjoined and hanging from top of filament tube: rachillae or spikes few and finger-like at top of slender ascending peduncle: blade of leaf simple, bifid at apex with 2 long points.....22. ASTEROGYNE
- hh. Leaf divisions or leaf itself with erose, dentate or truncate expanded end.
- i. Leaves long-pinnate or -pinnatifid, the pinnae or segments quaquaversal (standing in all directions or planes): fruits 2.5 cm. or more long: tall trees.
- j. Stamens 9 or 10, or less than 20: spathes many.....23. IRIARTEA
- jj. Stamens usually more than 20, commonly 25-35: spathes of about 2 parts.....24. SOCRATEA
- ii. Leaves entire and the blade more or less split or divided at its base: fruit a hard oblong body less than 15 mm. long: plant very small.....25. MALORTIEA

1. CRYOSOPHILA Blume. "Escoba"

CRYOSOPHILA Blume, in Rumphia 2:53, in nota. 1836.

Acanthorrhiza Wendl. in Gartenfl. 18:241. 1869; Bot. Zeit. 37:147. 1879.

Arboreous but not very tall fan-leaved single-trunk palms, with branching and more or less extensive root-thorns on the trunk or at least near the base of it but the plants devoid of true spines: leaf-blades glaucous or very thinly pubescent on lower surface, divided to near the base into many narrow segments: spadices interfoliar, briefly branched, usually shorter than the leaves, the clusters attended by broad and conspicuous papery more or less tomentose nodifronds: flowers hermaphrodite, the parts in 3's; petals free or connate; 6 stamens and 3 stigmas exerted from the more or less closed perianth at full anthesis, filaments united part of their length; ovary 3-loculed: fruit drupe-like, globose, oblong or short-pyriform, 2-3 cm. or less long, exterior fleshy but usually firm at maturity, containing commonly a single pea-like seed.

Five recognized species, Mexico to Panama. One of them, the Mexican *C. nana* (*Acanthorrhiza aculeata*, A. Mocinii) has been grown in palm houses.

- a. Lower surface of leaf-blade finely but definitely appressed-pubescent, nerves not rusty, and also silvery: fruit more or less pyriform, often 2.5 cm. long.....1. *C. WARSCEWICZII*
- aa. Lower surface of leaf-blade dull white-tomentose and usually also silvery, nerves brownish to rusty: fruit short-obovoid to globose, 17 mm. or less long.....2. *C. ALBIDA*
1. CRYOSOPHILA WARSCEWICZII (Wendl.) Bartlett, in Bot. Maya Area in Carnegie Inst. Wash. Publ. No. 461:38. 1935.

Acanthorrhiza Warscewiczii Wendl. in Gartenfl. 18:241. 1869; Drude, in Mart. Fl. Bras. 3: H. 132, 133 (non p. 554). 1882.

Slender erect tree sometimes to 12 or 13 m. but in forests often seen in much shorter stature, diameter of trunk above the enlarged base perhaps 8-10 cm.; root-thorns often 16 cm. and more long, deflexed but usually upwardly curved, passing into regular roots near the ground: leaves soft, 2 m. or more across, palmate, light green on upper surface, silvery and closely pubescent under a lens on lower surface; petiole slender, 2 m. or less long; hastula short, triangular-conic and blunt; main segments extending nearly to base of blade and 1 m. or so long, 2-7 cm. broad: spadix downward-curved, densely flowered, 60-70 cm. long, branching at nodes, the creamy-white long-acuminate nodifronds covering lower part of spadix-branches: flowers about 4 mm. long when open, nearly globular, crowned with the deflexed elongated anthers: fruit oblong-pyriform or only shortly narrowed at base, 3 cm. or less long, about 15 mm. thick, smooth and lucid.

Woods in Panama, of undiscovered distribution.

CANAL ZONE: Barro Colorado Island, *Bailey 110*; abandoned cacao plantation, Las Cascadas, near Summit, *Dodge & Hunter*; along Madden Road, *Bailey 558*.

Application of the name *Warscewiczii* is confused and untrustworthy, but the case cannot be worked out satisfactorily until the *Cryosophilas* of Panama are more fully collected.



Fig. 44. *Cryosophila albida*

2. *CRYOSOPHILA ALBIDA* Bartlett, op. cit. 40. 1935.

Leaves dull tomentose underneath due to mixture of white and rusty hairs; nodifronds short, 10 cm. long, rather abruptly acuminate: fruit obovoid or subglobose, broad, 17 mm. or less in length, 14 mm. thick.

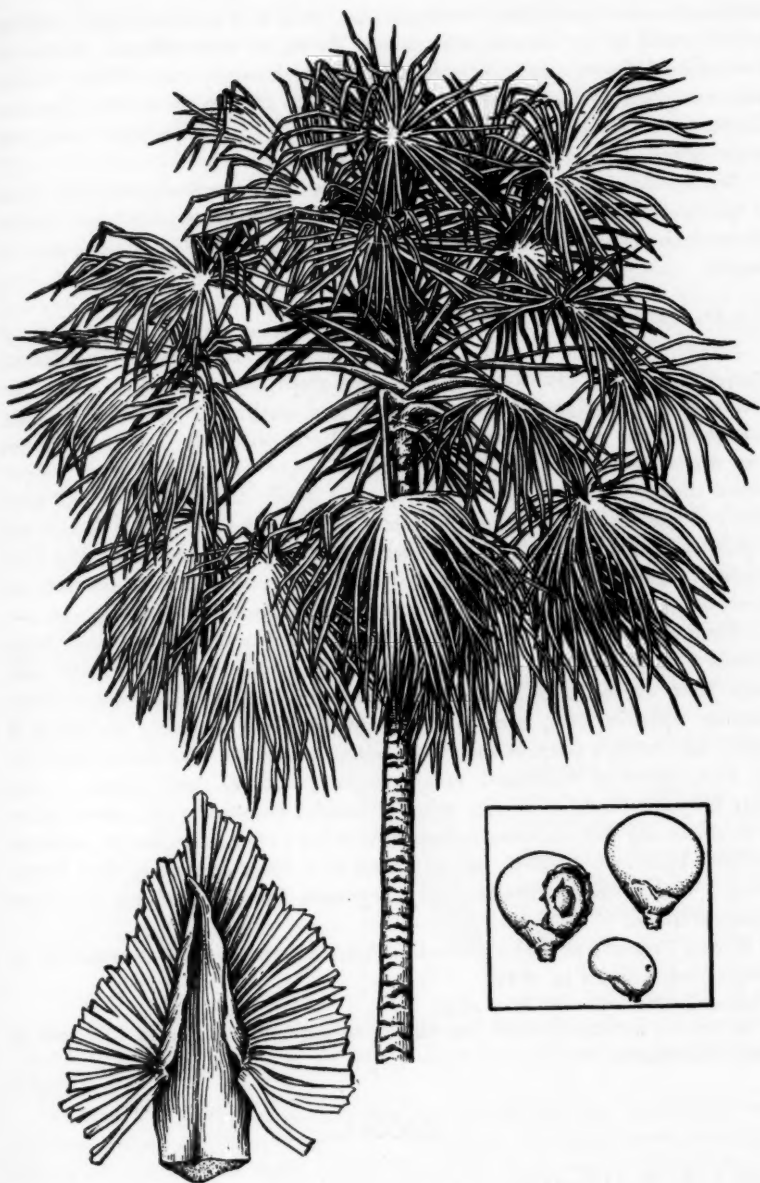
Costa Rica and Panama.

DARIÉN: near Boca de Pauarando on Sambú River (Bartlett, citing *Pittier 5688*). COCLÉ: north rim, vicinity of El Valle de Antón, *Allen 1902*, 3 m. tall.

2. *SABAL* Adans. "Palmetto"

SABAL Adans. ex Guersent, in Bull. Sci. Soc. Philom. (Paris) 3:205, t. xxv. 1804.

Spineless tree palms but the trunk sometimes rising little above the ground, base of the bole oblique, usually characterized by the essentially palmate leaf-blade through which a rachis (continuation of petiole) runs to the limit of the palman or undivided part, presenting a costapalmate structure and a curiously curved blade with the end of it declined toward the ground: spadices interfoliar, lacking a cymba but provided with conspicuous elongated green herbaceous

Fig. 45. *Sabal Allenii*

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sheathing nodifronds: flowers hermaphrodite, parts in 3's; calyx tubular or parts united; petals 3, the narrow petals widely flaring or even reflexed; stamens 6, exerted in anthesis; carpels 3, style united, stigma usually not divided: fruit a hard nearly globular or oblate or pyriform body 25 mm. or less in transverse diameter; seed commonly 1 by abortion, micropyle lateral, in some species the mesocarp remaining as a fibrous envelope of the seed.

Western hemisphere, from North Carolina to northern South America; about 25 species now admitted. Many of the species are planted, some of which are not yet recognized in the wild; one species recently discovered in the Republic of Panama.

1. *SABAL ALLENII* Bailey, Gent. Herb. 6:200. 1943.

Slender erect palm to 20 m., trunk soon becoming bare and showing distinct rings, about 30 cm. diameter at base; crown about 15 m. above the ground on mature trees, consisting of 20-30 live leaves and usually 5-7 dead leaves hanging underneath (and piles of accumulated fallen leaves about the trunk): leaves to 2 m. across, thin in texture, glossy green on upper surface and much lighter-colored though not glaucous underneath, very deeply divided into 40 and more narrow ridged segments, without filaments, palman 30-45 cm. long beyond top of petiole; hastula 8-9 cm. in length, narrowly long-pointed, margins rolled in or incurved; segments 6-12 cm. across, 1.5 m. long and produced into very long and narrow or even almost thread-like extremities, soon divided into subsegments 2-4 cm. broad at base, the 1, 2 or 3 midribs strongly upstanding 2-3 mm. high, with secondary intervening ribs and furrows and then fine lengthwise parallel lines, many faint curved cross-lines that are more prominent underneath, surfaces glabrous: spadices erect, very open and diffuse, about equalling the leaves in length, the branches glabrous and striate, ultimate rachillae very slender and 6-10 cm. long, apices of nodibracts very acute or produced, sheaths striate: fruit glossy brownish-black, 8-10 mm. across at middle, sometimes twin, nearly globular to oblate and short-tapering to base so that most of the samples are somewhat pyriform, basal part scarified; seed contained in a fibrous mesocarp, dark brown, oblate, 5-7 mm. thick crosswise, glossy, depressed, faintly ribbed top to bottom, micropyle lateral.

Woods, Panama; on Pedro Gonzalez, Perlas Islands, where it was said to be confined, taken twice in 1941.

PANAMÁ: Perlas Islands, *Allen 2604*.

Leaves are commonly used for thatch throughout the Islands. Known as *Palma de Guagara*.

3. *COCOS* L.

Cocos L. Sp. Pl. 1188. 1753.

Trees with single usually leaning or oblique trunk becoming nude and ringed,

feather-leaved, spineless, monoecious: spadices interfoliar, shorter than the leaves, included at first within striate woody but not sulcate or furrowed large cymbas, the inner and longer one of which may persist as a dead object even after the fruit is grown; nodifronds reduced to scale-like bracts 2-4 cm. long that may have more or less perished by fruiting time: flowers staminate and pistillate, one of the latter normally standing between two of the others near the base of the strand or rachilla but the upper part of the strand staminate and many strands wholly staminate: fruit a great heavy indehiscent fibrous husk containing 1 hard-shelled nut that bears 3 prominent pores or micropyles at the end opposite the attachment to the tree, part of the contents remaining liquid; embryo basal; 3 inner envelopes of the staminate flowers much exceeding the 3 outer ones or calyx and lightly imbricate; envelopes of pistillate flowers very broad, striate, strongly imbricate.

As now defined, the genus is monotypic. Species of the western hemisphere formerly referred to it are segregated into other genera, none of which is known to be native in Panama.

1. *COCOS NUCIFERA* L. loc. cit. 1753. "Coconut."

Erect but not usually straight, being curved or bent in various ways, sometimes 30 m. tall, the bole seeming slender for the size of the crown: leaves bright

green, very long, often 5-6 m. and more than 1 m. broad, the many single-ribbed but striate glabrous pinnae 4-5 cm. broad; petiole short and stout: spadices 1-2 m. long, conspicuously forking in axils of the leaves, the prominent yellow-white pointed caducous staminate flowers about 1 cm. long, pistillate flowers much larger: fruits few to several on a spadix, near the base of the branches, obtusely triangular, to 30 cm.

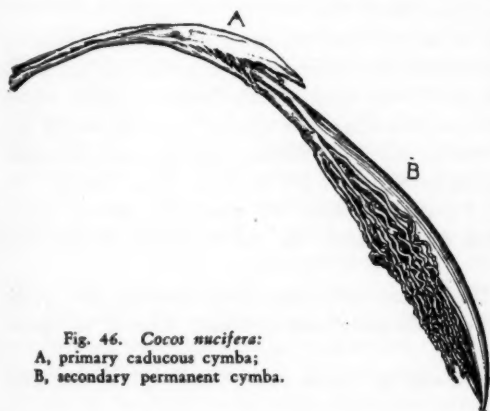


Fig. 46. *Cocos nucifera*:
A, primary caducous cymba;
B, secondary permanent cymba.

or more long and more than one-half as thick, the nut itself 10-12 cm. thick but variable in size and bearing at its base 3 large eyes representing locules of the ovary.

Attributed to Asiatic tropics but now spontaneous and wild around the world and constituting the palm scenery on the littorals of many lands; extensively planted for the yield of edible fruits. The products are many, as dried flesh or copra and fiber of the husk or coir. There are numbers of horticultural varieties.

CANAL ZONE: Chagres, Isthmus of Panama, Fendler 424.

4. SCHEELEA Karst.

SCHEELEA Karst. in *Linnaea* 28:264. 1856.

Heavy and often massive erect monoecious and polygamous spineless trees, with long large ascending pinnate leaves that make a great vase-form crown, trunk eventually becoming 15 m. or more tall but often bearing profusely when it is yet short and holding the leaf-bases, the denuded old bole marked with rough circular scars where the leaves were borne: spadices infrafoliar from lower part of crown, at first spreading but soon declined and in fruit usually pendent, the woody deeply sulcate main cymba often as long as a man, axis of cluster simple and bearing numerous simple side branches, in fruit becoming a ponderous hanging truss: staminate flowers usually occupying the upper length of the rachillae and pistillates the basal part but some trees bearing only staminate, others only pistillates and the bloom then not showy; floral envelopes 6, the 3 petals in staminate flowers terete and very narrow or even subulate, stamens 6, short and included; envelopes broad in pistillate flowers, imbricate, pistil 3-loculed and stigmas 3: fruit ovate or oblong, drupe-like but becoming a hard body with close fibrous covering and large accrescent calyx, although the mesocarp is mucilaginous at first, 1- to 2-seeded; albumen hard, continuous; embryo basal.

Species above 40, from Cuba and Mexico to Brazil, Peru and Paraguay.

1. SCHEELEA ZONENSIS Bailey, *Gent. Herb.* 3:36. 1933.

Ponderous tree, at maturity 10 m. and more tall and 2 m. in circumference at a meter above the ground: leaves standing more or less edgewise; petiole 30-60 cm. long; blade 5-6 m. long; rachis very stout, double-furrowed above; pinnae stiff, 1 m. or more long and 4-6 cm. broad, more or less furfuraceous, midrib very strong but intermediate veins faint: staminate flowers ochroleucous at anthesis, much frequented by insects: great outer cymba 2-3 m. long: fruit oblong, 6 cm. or more long including calyx, 3 cm. thick, beak 7-8 mm. long, surface brown, smooth and closely striate when dry, 1-seeded, the nutlet covered with a hard thin fibrous husk.

Common tree across the Canal Zone and neighboring territory, its general distribution unreported; in low or moist places and in woods. One of the species known as *Palma Real*.

CANAL ZONE: Barro Colorado Island, by lookout tower, *Bailey 1*; Fairchild Trail, *Bailey 14*.

This is the palm long known on the isthmus as *Attalea Cobune* (now *Orbignya Cobune* Dahl.) and *A. gomphococca*. The former (*A. Cobune* Mart.) was first based on indefinite records of a palm cultivated in England and supposed to come from Honduras; it is attributed to Mexico and other regions, and the name is frequently erroneously applied to planted trees. *A. gomphococca* Mart. was likewise based on lists of plants in cultivation in England and supposed to have come from Central America but without definite locality. It has recently been transferred as *Scheelea gomphococca* (Mart.) Burret. The species is not understood.

5. COROZO Giseke. "American Oil Palm"

COROZO Giseke, in L. Praelect. 42. 1792.

Alfonsia HBK. Nov. Gen. et Sp. 1, fol. ed.:245; quarto ed.:30. 1815.

Monoecious tree with trunk reclined or prostrate part of its length and producing roots along its straight or curved course, then upright a few feet and bearing a heavy crown of ascendate pinnate leaves free of the ground but the dead leaves hanging and broken: flowers staminate and pistillate in the same crown, in dense sessile heads in leaf-axils; staminate flowers in dense finger-like catkins in clusters at apex of peduncle and that soon perish; spathe soon becoming a mass of separating fibers; stamens 6, filaments connate; pistillate flowers sunken in the rachis of thick spikes that are compacted into a heavy durable head; ovary 3-celled, but usually only 1 carpel developing: fruit oblong or pyriform, drupe-like.

Central America to Amazon region, perhaps more than a single species.

1. COROZO OLEIFERA (HBK) Bailey, Gent. Herb. 3:59. 1933; 4:373. 1940.

Alfonsia oleifera HBK. loc. cit. 1815; Cook, in Nat. Hort. Mag. 19:20. 1940.

Elaeis melanococca Auth., non Gaertn.

Trunk lying few or several meters on ground as if creeping, upright part to 2 m. high and bearing ragged covering of old persisting leaf-bases: leaves long, regularly pinnate, ascending and finally spreading; petiole 1-2 m. long, the two sharp edges bearing spine-like teeth and undeveloped pinnae; blade 2-3 m. or more long, closely set with 60 or more pairs of pinnae which are 1 m. or more long and 5 cm. or more broad at middle, glabrous, prominently ribbed and parallel-veined: staminate catkins 20-25 cm. long and about 1 cm. thick; pistillate head 30-40 cm. long at maturity, consisting of many compacted spikes 10-18 cm. long, and each one ending in a black acute projection: fruit oblong, 3-4 cm. long, abruptly acute at apex, sitting in the shallow cup of the accrescent calyx, black at full maturity but preceded by orange.

Moist and swampy places, probably widely spread in Panama, known in the Zone from swamps of Colon Bay to open fields at Old Panama; the South American and Costa Rican extensions are supposed to be the same species. The fruits provided oil and tallow to early colonists. Until recently it was assumed that Gaertner's *Elaeis melanococca* is this species but it is undoubtedly only a fruit variant of the African oil palm, *Elaeis guineensis*, which is spontaneous in some parts of the western hemisphere and is also frequently planted for interest and ornament. The American oil palm is one of several species in different genera known in the vernacular as Corozo.

CANAL ZONE: near Fort Sherman, Bay of Limón, Bailey 216.

6. DESMONCUS Mart.

DESMONCUS Mart. Hist. Nat. Palm. 2:84. 1824. *Nomen conservandum*.

Atitara Juss. in Dict. Sci. Nat. 3:277. 1804. *Nomen rejiciendum*.

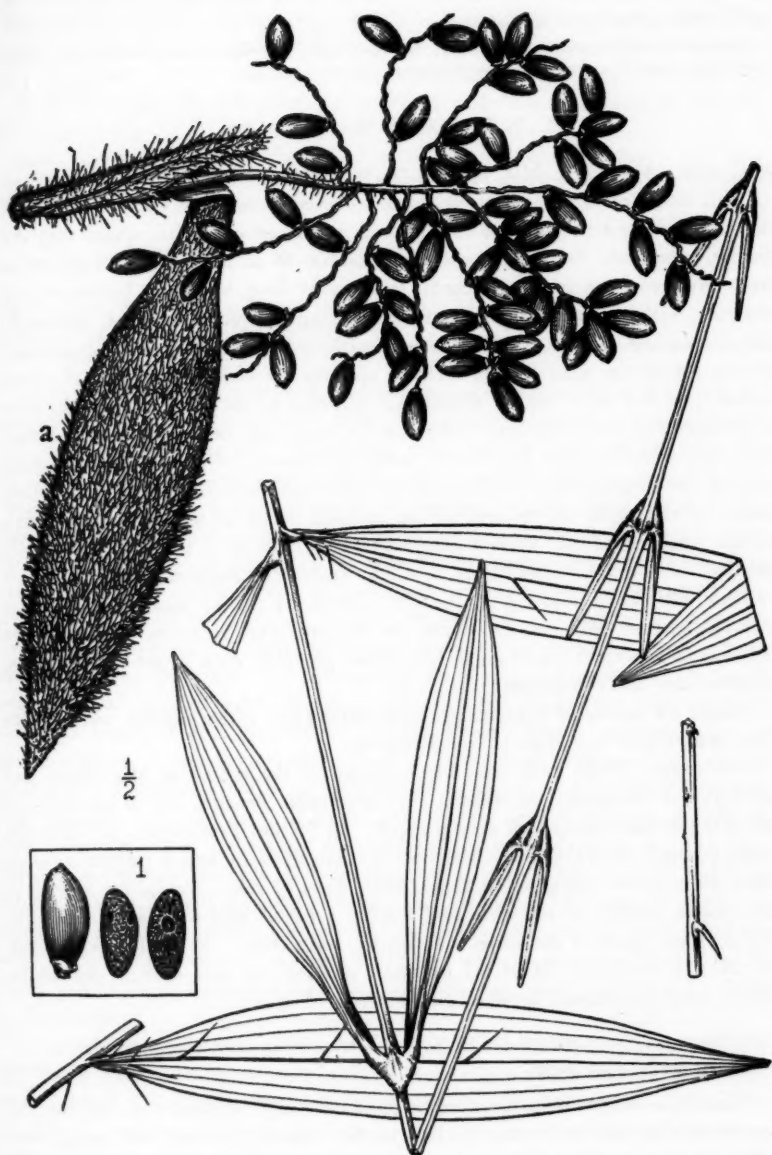
Slender climbing or clambering pinnate-leaved monoecious palms supported by spine-like modified pinnae and sometimes by hooked prickles on rachis and under-surface of leaves; pinnae alternate or opposite or multiple, the rachis ending in one or more sets of nodal leaf-spines pointing backwards and that are often bulbous at base, the end of the leaf often long and tendril-like: spadices interfoliar, short, once-branched, covered by 2 cymbas of which the interior one is large and more or less persistent and spiniferous or hairy or both on the exterior: staminate flowers occupying the upper part or the ends of the slender simple rachillae, stamens 6, pistillode sometimes present, calyx minute; pistillate flowers mostly near base of rachilla but sometimes occupying nearly all of it and the plant perhaps functionally more or less dioecious, ovary 3-loculed, stigmas 3: fruit small, drupe-like although the exterior is scarcely fleshy, ovoid or subglobose, 1-seeded, with 3 pores; seed with homogeneous albumen.

Species 40-50, Mexico, Central America, West Indies, South America, on bushes and often ascending tall trees. The hairy and spiny cymbas are often conspicuous as they hang.

Undoubtedly more than one species of *Desmoncus* is in Panama, but collected specimens are too imperfect to allow of determination. *D. chinantlensis* Liebm. of Mexico has been suggested as the name of one of the Panama collections, but this disposition is at least doubtful.

1. *DESMONCUS ISTHMIUS* Bailey, Gent. Herb. 6:211. 1943.

Long trailer and climber; trunks 1-2.5 cm. thick, glabrous and nude: leaves 2 m. long, with many large alternate pinnae becoming opposite on the upper part where they pass into 3 or 4 pairs of retrorse glabrous strong heavily based spines 3.5-4.5 cm. long; petiole and rachis sharply angled, glabrous or at places slightly furfuraceous, bearing a few straight spines 1-2 cm. long with now and then a stout broad-based sharp curved hook 3 mm. long; leaf-sheath many-striate and bearing many dark brown flat spines 5 mm.-2.5 cm. in length; pinnae long-lanceolate-acuminate, 15-24 cm. long, 2.5-4 cm. broad at middle, glabrous on both surfaces or with a trace of puberulence underneath, margins unarmed, midrib pronounced but the several side-veins indistinct, upper surface sometimes marked by elevated cross-lines, usually a spine 1.5-2 cm. long borne on midrib underneath at about the middle or toward the base: main or inner cymba 24 cm. long, 5-6 cm. broad, densely covered with blackish white-bottomed spine-like setae 1 cm. more or less long; primary spathe short and narrow; sheath of openly woven fibers and many blackish spines; spadix at anthesis 12-15 cm. long and 10 cm. broad, the glabrous rachillae later extending and likely to be fertile to the ends: fruit ellipsoid, nearly or quite 2 cm. long when dry and 8 or more mm. broad, abruptly pointed, glabrous; cupule not very prominent, inner series undulate or lightly indented and much more extended than the small ring-like calyx; seed 13-14 mm. long, 6 mm. thick, narrowly oblong, closely reticulated with light-colored rapheal lines

Fig. 47. *Desmoncus isthmus*

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issuing from the central micropyle that attaches to the outer shell of the fruit, and 2 pores prominent on the back.

PANAMÁ: Marraganti and vicinity, *Williams 691*. CANAL ZONE: Chivi-Chivi Trail, two miles above Red Tank, *Maxon & Harvey 6573*.

7. ACROCOMIA Mart. "Gru-gru"

ACROCOMIA Mart. Hist. Nat. Palm. 2:66, *tt.* 56, 57. 1824.

Tall single-trunked monoecious pinnate-leaved trees, very spiny (one exception) on bole and petioles and cymbas and sometimes on fruits; spines long and slender, commonly flattened, expanded or cushioned at base, usually black or at least very dark, not stiffly attached: leaves very long, becoming horizontal and drooping, with very many pairs of narrow hanging long-pointed pinnae, commonly glabrous on the upper surface but often indefinitely pubescent on upper surface; petioles prickly on outer convex surface: spadices infrafoliar, consisting of a long central axis and short mostly simple side-branches or rachillae; cymbas 2, outer or primary one soon caducous, inner one persistent and often hanging as a dead body long after the fruit has fallen: staminate flowers 5-7 mm. long, occupying most of the length of the rachillae and partially sunken in it, stamens 6; pistillate flowers at the angles on the base of the rachilla, about 10 mm. long, partly immersed, ovary 3-celled: fruit a drupe-like body size of a walnut, 1-seeded by abortion, olive-green or yellowish, 3-4 cm. transverse diameter, mesocarp mucilaginous with fibers running through it (sometimes edible) and that dries to a cork-like interior that stoutly adheres to the nut; rind becoming thin and then brittle as an egg-shell; nutlet conical to almost globular, with 3 eyes or micropyles, albumen hard and continuous.

About 25 species of conspicuous ornamental trees, often planted, native from Cuba and Mexico to Argentina and Paraguay.

Acrocomia divides itself into two sections on the nature of the trunk, and although the differences are striking they are seldom brought out in photographs and have not been recognized until recently. In Section Tectocomia, to which the single Panama species belongs, the bole is covered with broad petiole-bases on which most of the spines are attached; these bases or boots remain for several or many years, finally rotting away and leaving a naked bole with deep notch-like ring, or steps, most of the spines disappearing with them. In Section Sentocomia the trunk is soon divested of the caducous petioles; the bole then is marked by shallow rings intervening between circling rows of spines.

1. ACROCOMIA PANAMENSIS Bailey, Gent. Herb. 4:444. 1941.

A. vinifera Auth., non Oerst.

Variable in height, often fruiting on dry land when less than 2 m. tall but the tree eventually reaching 8 m., the bole at first densely clothed with spiniferous leaf-bases; crown of 10-15 leaves; petiole bearing black sharp spines 2-10 cm. long; pinnae 2-3 cm. broad, glossy and glabrous on upper surface but gray and

puberulent underneath: main or persistent cymba about 1 m. long, coarsely tomentose and somewhat spiny: fruit nearly or quite globular or somewhat flattened end-wise, about 3.5 cm. transverse diameter, covered with caducous floccules and crooked hairs, the mature fresh surface cream-colored with greenish tinge.

Panama: frequently remaining on properties when the land has been cleared.

Known as *Pacora*.

CANAL ZONE: Balboa, *Allen 2213*. PANAMÁ: near Panama City, *Bailey 552*; near Bella Vista, Panama City, *Bartlett 16977*. VERAGUAS: in groves near Ocu and Santiago, *Allen*.

8. *BACTRIS* Jacq.

BACTRIS Jacq. Select. Stirp. Amer. Hist. 1:279. 1763.

Augustinea Karst. in *Linnaea* 28:395. 1856.

Pyrenoglyphis Karst. Fl. Columb. 2:141. 1866.

Small bushy erect or sometimes semi-procumbent monoecious palms, in some cases more or less tree-like, most of them very spiniferous, commonly soboliferous from short rootstocks, spadices interfoliar, spines usually borne on all parts except perhaps on flowers and fruits: spadices short and covered in two spiniferous cymbas one of which is persistent: leaves pinnate or pinnatisect or pinnately lobed, the parts standing in one plane: spadix a single unbranched compact spike like an aroid within its spathe or in other cases with short simple spreading branches bearing pistillate flowers on lower part and staminate on the upper part although typically with a pistillate between 2 staminate, not sunken in the rachis, floral parts a calyx of 3 sepals or lobes, petals same; staminate flowers with urceolate or cup-like calyx that enlarges in fruit, petals or corolla-lobes much larger, valvate, stamens 6-12, pistillode very small or absent, the full staminate bud often angular from compression; pistillate flowers usually smaller, ovary 3-loculed, stigmas 3 and mostly conspicuous at moment of anthesis: fruit drupaceous, small, globular or oblate or pyriform or turbinate, mostly less than 5 cm. long, 1-seeded, mesocarp more or less succulent even though thin and usually of little substance, mealy or fibrous when dry, exterior cream-white or yellowish, orange or reddish or purplish and sometimes aculeate or setose but the armature commonly soon vanishing; floral envelopes accrescent and forming a cupule at base of fruit, sometimes the lobes in each series separate and in other cases the series constituting a double crenate cup; nutlet with 3 prominent pores one of which is functional; albumen hard and homogeneous; raphe represented usually in reticulations.

Tropical western hemisphere, from Cuba and Mexico to South America, nearly 200 species recognized, in many habitats. Accounted a difficult genus in identification but not inexplicable when proper specimens are available.

Related genus is *Guilielma* which is native in Costa Rica and the same or a similar species in Colombia and southward, but not reported as a native palm in Panama although frequently planted. The genus is included in *Bactris* by many

authors but the habit of the plant and general features are so unlike that the two may well be held apart. *Guilielma* is distinctly tree-like even though somewhat soboliferous, pinnae linear and acuminate and commonly standing in more than one plane on the rachis, fruit a large highly colored fleshy edible drupe known as *Pejibaye*, *Chonta*, *Gachipaes*, *Peach Palm* and by other names. The plant in Costa Rica is known as *G. utilis* Oerst. and in Colombia and Brazil as *G. Gasipaes* (HBK.) Bailey (*B. speciosa* Mart.)

- a. Leaves simple, consisting of a pinnately veined blade deeply bilobed at apex: plant soon becoming nude from the weathering away of the few weak spines..... 1. *B. PAULA*
- aa. Leaves pinnate, with distinct and separate leaflets or pinnae either side the rachis: plant permanently spiniferous.
 - b. Foliage conspicuously yellow-pilose on both surfaces and rachis..... 2. *B. ALLENIANA*
 - bb. Foliage glabrous, or sometimes inconspicuously puberulent (under a lens) on one surface or the other.
 - c. Species with bright green glossy leaves not rigidly and closely costate (main secondary veins 8-10 mm. apart), sides curving and not parallel for any distance, apex prominently acuminate and often caudate, margins nude or not conspicuously setulose.
 - d. Petiole devoid of spines except at base, as also the rachis.
 - e. Pinnae 30 cm. and more long: fruit black; cupule crenate..... 3. *B. COLONIATA*
 - ee. Pinnae less than 20 cm. long, very glossy: fruit orange; cupule without crenate border..... 4. *B. AUREODRUPA*
 - dd. Petiole spine-bearing throughout its length; rachis also sometimes spiniferous.
 - e. Pinnae short-caudate or only acuminate, marked on upper surface with cross-lines between the nerves: cupule of an outer series (calyx) of 3 deep lobes and an inner series (corolla) with nearly entire margin and setose..... 5. *B. FUSCOSPINA*
 - ee. Pinnae long-caudate and no elevated cross-lines: cupule divided into deep lobes in both series..... 6. *B. DIVISICUPULA*
 - cc. Species with gray-green mostly not glossy foliage; pinnae strongly marked with close usually parallel nerves (close and thin in *B. oraria*, not deeply parallel in *B. superior*), margins manifestly setulose.
 - d. Upper surface of pinnae conspicuously marked with elevated cross-lines between the main nerves (tessellate or reticulate).
 - e. Petiole spine-bearing only at or near base, some of the spines 15 cm. long: fruit dark green becoming orange-red, hairy; cupule shallow and flat..... 7. *B. BARRONIS*
 - ee. Petiole armed throughout, the spines 5 cm. or less long: fruit deep orange, smooth; cupule shallow, lightly crenate..... 8. *B. COLORADONIS*
 - dd. Upper surface of pinnae lacking manifest elevated cross-lines: outer ring of cupule flat, scarcely cupulate.
 - e. Pinnae short and narrow, mostly 20 cm. (sometimes 30 cm.) and less long, often less than 1 cm. broad, parallel veins all thin, sides parallel: plant often procumbent or clambering: shores (orarian)..... 9. *B. ORARIA*
 - ee. Pinnae much larger, the rib and side-veins making ridges lengthwise: plant erect: mostly inland.
 - f. Shape of pinnae broad in middle (about 4 cm.) and narrowed either way; rachis sparsely tomentose to glabrescent: fruit 4-5 cm. long, apex conic..... 10. *B. SUPERIOR*
 - ff. Shape of pinnae about the same width throughout their length (except of course at ends), 2-3 cm. or less broad; rachis of leaf rusty-tomentose.
 - g. Attachment of pinnae 3-5 cm. apart, giving the leaf an open look: fruit oblong or acorn-like, 4 cm. long, with somewhat parallel sides..... 11. *B. BALANOIDEA*
 - gg. Attachment of pinnae close together, giving the leaf a crowded and continuous look.

- h. Petiole devoid of hispid hairs; apex of pinnae not long and narrowly acuminate: fruit globular-oblong, about 4 cm. long, with curving sides, not becoming peaked in drying.....12. *B. AUGUSTINEA*
- hh. Petiole beset with hispid hairs among the spines: pinnae slenderly acuminate: fruit ellipsoid or elliptic-ovoid, 4-5 cm long, peaked when dry.....13. *B. MAJOR*

1. *BACTRIS PAULA* Bailey, Gent. Herb. 6:226. 1943.

Very slender with 3-6 or sometimes 10 culm-like stems or canes in a group or colony, 2-2.5 m. tall; trunk or cane less than 1 cm. thick, glabrous and smooth, nodes 4-5 cm. apart; plant bearing a few slender spines that soon weather away, leaving it nude: leaves usually 3 to a culm and near the top of it, simple but deeply bilobed, soft-pubescent underneath, glabrous above and with broken cross-lines between the many prominent veins, midrib lacking on the lobes or divisions; lobes of leaf 25 cm. long and 7-8 cm. broad, apex long-acuminate, margins with apiculate points; petiole 5-8 cm. long, scurfy-pubescent as well as the rachis; leaf-sheath narrow, striate, pubescent: cymba 8-9 cm. long, about 3 cm. broad at maturity, thinly covered with setose white-bulbous brown hairs: fruit globular, beak short, bright red or orange-scarlet, about 12 mm. diameter.

Panama.

COCLÉ: heavy forest, where it is infrequent, vicinity of La Mesa, El Valle de Antón, alt. about 1000 m., *Allen 2567*; hills north of El Valle de Antón, trail to La Mesa, *Allen 2695*.

2. *B. ALLENIANA* Bailey, Gent. Herb. 6:228. 1943.

Trunks few to several, 3 m. tall and about 2.5 cm. thick at base, arundinaceous or cane-like, the prominent nodes about 6-8 cm. apart, with scattered very thin spreading spines 1-2 cm. long, canes pithy in cross-section: mature leaves 3-4 at apex of each cane, 1.5-2 m. long, soft or thin in texture, evenly pinnate, both surfaces and rachis conspicuously hirsute and exposing a golden glint in sunlight; pinnae opposite and alternate, 30-40 cm. long, 3-4 cm. broad, apex produced into a very slender tail-like extension, midrib not very prominent and attended on either side by 3 or 4 strong side-nerves, hairs numerous but particularly prominent on veins underneath, spineless; rachis very hirsute and bearing many light-colored white-based spines 2-5 cm. long, and which may be somewhat longer and more conspicuous on the petiole; leaf-sheaths conspicuously long, tightly clasping the cane, armed with both dark-colored and light-colored weak spines: cymbas or spathes attached among old leaf-bases on under side of crown, 15-20 cm. long, very densely woolly with tawny hairs 1 cm. and more long, the small outer or primary cymba little or not at all hairy; flowering spadix dense, about 10 cm. across either way, with very many slender rachillae; staminate flowers pedicelled: fruit oblate, 10-12 or more mm. across, flat on top, beak prominent, unarmed, glabrous, striate; cupule shallow, with few obtuse lobes.

Panama.

COCLÉ: hills north of El Valle de Antón, alt. about 700 m., *Allen 1804, 2574, 2957*, in deep shade.

3. *BACTRIS COLONIATA* Bailey, Gent. Herb. 3:106. 1933.

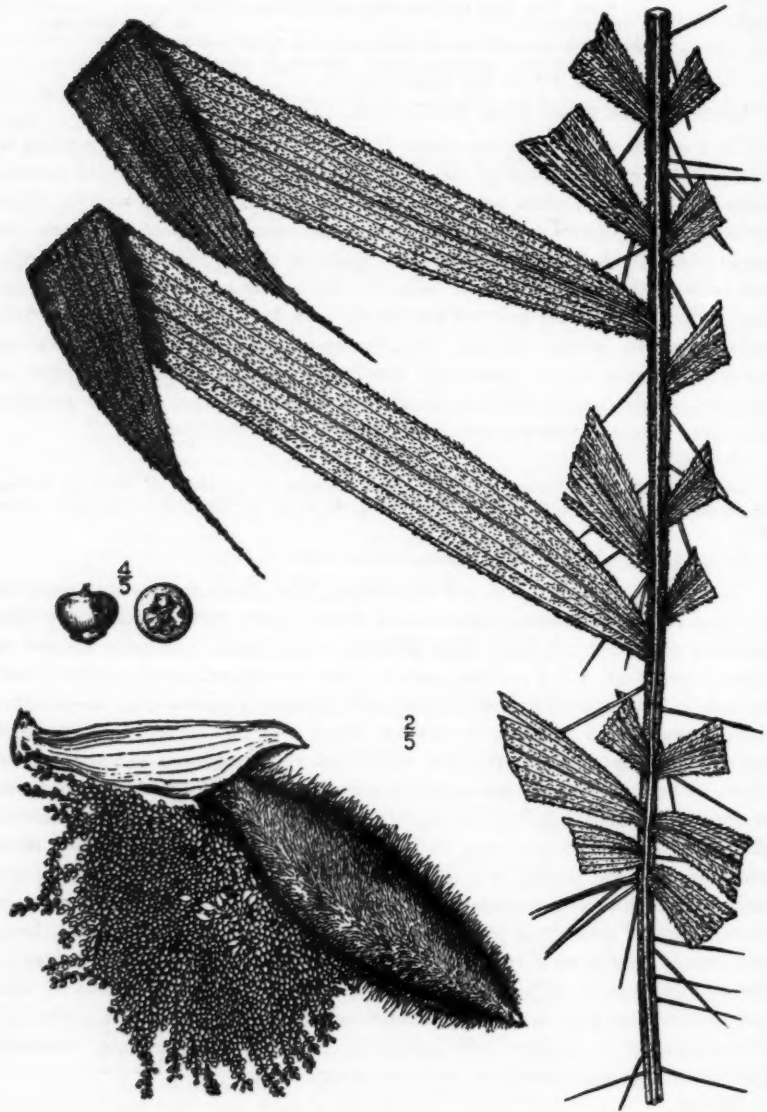


Fig. 48. *Bactris Alleniana*

Graceful and slender, growing in open but not crowded large colonies; trunk 3-6 m. tall, about 4 cm. thick, irregularly ringed with brown-black bulbous-based spines 3-8 cm. long that are ascending on upper parts of bole and more or less declined on lower parts, the intermediate blank spaces often as much as 15 cm.



Fig. 49
Bactris colonata

long, the plant spreading by means of subterranean stems: leaf-blades 2 m. more or less long, glossy, thin in texture, interruptedly pinnate; petiole 1 m. or more long, slender, sometimes furfuraceous, nearly terete, bearing light-colored spines 1-3 cm. long toward the base and otherwise unarmed, rachis usually unarmed; pinnae about 25 subopposite pairs spaced 5-8 cm. apart, to 75 cm. long and 4-5 cm. broad, glabrous, midrib prominent and side-veins sometimes

nearly equally so, margins minutely setulose, apex prolonged into a narrow nearly or quite caudate part, this part particularly slender and conspicuous on the broad pinnae of young plants: cymba or spathe 20-30 cm. long, densely brownish or tawny-setose: fruit turbinate, 2-2.5 cm. long, black, with abrupt short stout beak, glabrous; cupule double with bluntly scalloped edges; nutlet about 12 mm. either way, flattened on top, contained within a fibrous mesocarp.

Panama; called *Uvito*.

CANAL ZONE: woods, Barro Colorado Island, on dry land.

4. *BACTRIS AUREODRUPA* Bailey, Gent. Herb. 6:232. 1943.

Very slender palm, 3 m. tall; trunk arundinaceous, 1-2 cm. thick, bearing a few small blackish thin spines; leaf-sheaths 20 cm. or more long, closely clasping, armed with very thin spines 1-2.5 cm. long: leaves about 1 m. long, pinnae irregular in attachment, very glossy on under glabrous surface, less glossy on duller upper surface which also discloses a very close puberulence under a lens; pinnae 14-16 either side the slender puberulent rachis, with alternate attachment toward apex but scattered on lower part, unarmed but perhaps a spine or two on the petiole, the pinnae thin in texture, 16-20 cm. long and 2-2.5 cm. broad, long-acuminate and very sharp, midrib not very prominent and accompanied by conspicuous nerves on either side, margins hispidulose: cymba 10-14 cm. long, appressed on middle with short blackish setose hairs: fruiting spadix 7-9 cm. across either way, rachillae lightly pubescent: fruit pyriform, 12-14 mm. long, 9-10 mm. thick, glabrous, orange, beak so small as to be hardly noticeable; cupule about 3 mm. deep, with almost continuous and only notched or broken edges.

Panama.

COCLÉ: hills north of El Valle de Antón, alt. 1000 m., Allen 2150.

5. *BACTRIS FUSCOSPINA* Bailey, Gent. Herb. 6:228. 1943.

Slender, leafy, arundinaceous, 3 m. tall; trunk 1.5-2 cm. thick, pithy, nodes about 5 cm. apart and usually spiny on at least one side, internodes nearly or quite nude, main spines mostly brown-black and 2-3 cm. long: leaves 1 m. and more long, glossy, glabrous, unequally and abruptly pinnate; petiole more or less scurfy

or furfuraceous, very unevenly armed on the sheath with brown and tawny spines 5 mm.-3 cm. long; rachis glabrous or with traces of furfur, bearing on the lower part and petiole many broad tawny dark-tipped reflexed spines 4-4.5 cm. long; pinnae 12-16 either side the rachis, alternate and with long unoccupied spaces, 20-25 cm. long, 2.5-9 cm. broad, the terminal pair much the broadest, midrib often not definite, other ribs few to several and very prominent and with indistinct cross-veins between them on the upper surface, margins unarmed, apex acuminate and sometimes short-caudate: cymba 15-20 cm. long, narrow, densely covered with tawny spines 2 cm. or less long: fruiting spadix 10 cm. long and broad, rachillae indifferently pubescent: fruit (immature) oblong-conic, prominently beaked, glabrous; cupule 5 mm. deep, outer series of 3 nearly separate striate lobes, inner series deeper and urceolate with a nearly entire margin and the exterior prominently strongly setose (the setae likely to perish with handling).

PANAMÁ: Cerro Campana, Allen 2086.

6. *BACTRIS DIVISICUPULA* Bailey, Gent. Herb. 6:230. 1943.

Slender, 4 m. tall; trunk arundinaceous, 2.5 cm. or less thick, pithy in center, nodes 6-7 cm. apart and the intervals nude; leaf-sheaths long and tightly closing and thickly provided with brownish-white black-based flat spines 3 mm.-4 cm. long: leaves glossy and glabrous, 1 m. or less long, irregularly pinnate, bearing flat spines between the pinnae on some parts of the rachis, and the pinnae sometimes few; pinnae 30-40 cm. long, some of them 4-5 cm. broad and others (particularly the terminal pair) as much as 9 or 10 cm. broad, apex slenderly caudate, the 5-7 prominent nerves widely spaced and the midrib not much more prominent than they; rachis nearly terete, glabrous except for indistinct lines of furfuraceous pubescence: cymba maturing often below the falling leaves, 15-20 cm. long, densely clothed with tawny flat prickles 2 cm. or less long: fruiting spadix short, 8-9 cm. across either way, the few short branches or rachillae pubescent; fruit oblate-pyriform, 11-14 mm. thick, top flat, beak pronounced, surface glabrous and when dry faintly striate, thin mesocarp adhering tightly to the large nutlet; cupule strongly divided into broad lobes or parts in each series.

Panama.

COCLÉ: northwest rim of El Valle de Antón, alt. about 600 m., Allen 1817.

7. *BACTRIS BARRONIS* Bailey, Gent. Herb. 3:101. 1933.

Low or intermediate, 2.5-8 m. tall, in small clumps (sometimes only 2 or 3 or 4 boles); trunk 4-6 cm. thick, conspicuously ringed with black spines 1-4 cm. long: leaves 2 m. and more long, usually continuously pinnate but sometimes interrupted, pinnae on main part of rachis 2-5 cm. apart; petiole slender, 1 m. or more long, lower part carrying prominent spines some of which may be 10-15 cm. long, upper part unarmed; pinnae sometimes 1 m. long and about 3 cm. broad, gray-green and conspicuously cross-veined between the prominent side-ribs, midrib upstanding, glabrous on both

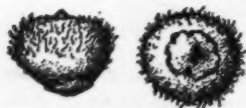


Fig. 50
Bactris borronis

surfaces, glossy above, setulose on margins of upper part, apex oblique: cymba or spathe 15-30 cm. long, densely black-spiny; spadix dense, the fertile part short and 10-15 cm. long: fruit broad-turbinate or short-pyriform, truncate at apex, about 1 cm. thick and a little longer, often angled by pressure, dark green for a long time but eventually orange-red, the upper part covered with short bristly hairs but which are caducous or may soon weather away; cupule small, nearly or quite flat, equal in the two series, shallowly lobed.

Panama.

CANAL ZONE: woods, Barro Colorado Island, *Bailey* 503, 535; Canal Zone Forest Preserve, *Allen* 2538. PANAMÁ: Río La Maestra, *Allen* 9.

8. *BACTRIS COLORADONIS* Bailey, *Gent. Herb.* 3:104. 1933.

Bactris coloradensis Burret, in *Fedde's Rep. Sp. Nov.* 34:217. 1933.

Tall, slender, 8 m. or more, not soboliferous or definitely colonized; trunk 4 cm. thick, lacking definite rings, armed with scattered brownish-black spines 1-5 cm. long: leaves 3 m. long, irregularly pinnate, some of the pinnae clustered and others widely spaced; petiole 1 m. or more long, deeply channelled on upper face, pubescent, beset throughout its length with slender spreading brown-black spines



Fig. 51. *Bactris coloradonis*

1-5 cm. long; pinnae 25 or more pairs, to 1 m. long, 3-5 cm. broad, glabrous, dull in color, midrib very prominent and side-ribs strong so that the pinna has a ridged look, rather strongly cross-veined, margins usually setulose on upper part, apex a very slender tail-like extension: cymba or spathe 25 cm. long, densely brown-acicular, usually falling before fruit matures: fruit in a close short cluster, globular to obovoid or short-pyriform, 2-2.5 cm. long and 1.5 cm. thick, obtuse and beakless at apex, glabrous, attractive deep orange; nutlet about 12-15 mm. across and a little less in height; cupule shallow and small, with lightly crenate margins.

Panama.

CANAL ZONE: dry woods, Barro Colorado Island, *Bailey* 502, 653.

9. *BACTRIS ORARIA* Bailey, *Gent. Herb.* 6:232. 1943.

Stems cane-like, usually about 4 m. but sometimes 6 m. tall, 2-3 cm. thick, not always erect but often twisting or almost scandent or procumbent on surrounding vegetation, foliage with a light grayish aspect, in colonies of many canes: leaves pinnate, nearly or quite 1 m. long, 5 or 6 in number and tufted at top of cane; petioles about 20 cm. long, flattened on upper surface and convex on lower surface, with sparse gray black-pointed spines 5-9 mm. long and a few flattened ones 2.5-6 cm. long; leaf-sheaths long, more or less imbricate, persistent, covering much of the cane, short-spiny, upper margins held together by fibrous network; pinnae 65-75, mostly opposite but often with open intervals between them, small, 25-30 cm. long, 2.5-3 cm. broad, the upper ones sometimes only 10-12 cm. long and 9-12 mm. broad, acuminate to sharp points, glabrous, midrib marked but the

many lateral veins hardly noticeable, margins scabrid; rachis bearing spines 2-8 cm. long: cymbas firm, interfoliar, persistent, expanded or protruding part of inner or main cymba 14-16 cm. long, 6.5-7.5 cm. wide, acuminate to slender point, bearing many short gray spines some of which may weather away; rachillae when dry; cupule very small, strongly lobed, striate, scarcely applied to base of drupe 6-9 cm. long, terete, slender, glabrous: fruit oblate and somewhat irregular in circumference, 20-22 mm. across the long way, about 15-17 mm. high, very little tapered to base, top flat and beak very small, yellow, glabrous, strongly wrinkled when dry; cupule very small, strongly lobed, striate, scarcely applied to base of drupe.

Panama.

CANAL ZONE: vicinity of Farfan Beach, *Allen 2580*. PANAMÁ: beaches just back of the sea sands, Nueva Gorgona, *Allen 2551*; Taboguilla Island, Panama Bay, *Allen 2543* (TYPE); Trapiche Island off coast of Pedro Gonzales, Perlas Islands, *Allen 2614*. COCÚ: Aguadulce, along outskirts of the tidal belt, *Pittier 4975*.

10. *BACTRIS SUPERIOR* Bailey, *Gent. Herb.* 3:99. 1933.

Pyrenoglyphis superior (Bailey) Burret, in *Fedde's Rep. Sp. Nov.* 34:246. 1933.

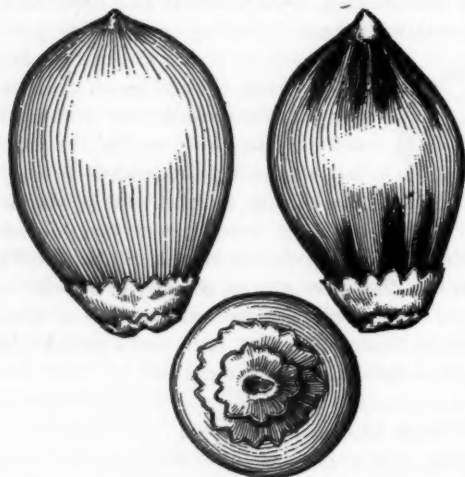


Fig. 52. *Bactris superior*

Tree 5-10 m. tall or in dense woods to 15 m. or more, in open colonies or sometimes as single plants but not extensively soboliferous, trunk 3-5 cm. thick bearing rings of blackish spines 4-5 cm. long and blank spaces between the successive rings: leaves 2 m. or more long, evenly pinnate, petiole bearing spines 2.5 cm. long and a few longer ones interspersed; pinnae 30-40 pairs attached 2-5 cm. apart, 40-75 cm. long, 3-4 cm. broad at middle, dull green and somewhat lighter-colored underneath, glabrous on upper surface and very closely puberulent on under surface, margins setulose, midrib prominent and side-ribs well marked, apex oblique: spathe or cymba 30-40 cm. long, pubescent or scariosa on surface, covered with black short weak spines: fruit oblong-turbinate to somewhat obovoid when fresh but conic-pointed when dry, 3.5-5 cm. long, purplish at full maturity, glabrous, cupule prominent.

Panama.

CANAL ZONE: woods on Barro Colorado Island, *Bailey 162*. PANAMÁ: Río La Maestra, *Allen 42*.

11. *BACTRIS BALANOIDEA* (Oerst.) Wendl. in Kerchove, *Les Palmiers*, 233. 1878.

Augustinea balanoidea Oerst. in Kjoeb. *Vidensk. Meddel.* 1858:39. 1859.

Pyrenoglyphis balanoidea Karst. *Fl. Columb.* 2:142. 1866.

Slender, in large thickets but not densely soboliferous, very spiny but old trunks becoming almost bare: leaves 1-2 m. long, evenly pinnate; petiole very slender,

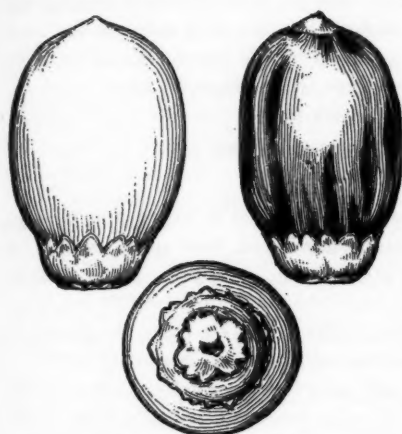


Fig. 53. *Bactris balanoidea*

50-75 cm. long, about 1 cm. thick, rusty-pubescent, the dark brown spines 2-7 cm. long, the rachis well armed and pubescent; pinnae 30-40 pairs, 2-5 cm. apart at points of attachment, 30-50 cm. long, 1-2 cm. broad, grayish-green, puberulent on under surface, margins spiculate, midrib prominent and thinner veins either side: spathe or cymba 15-65 cm. long, thickly covered with blackish prickles; spadix bearing about a dozen simple short branches, pistillate flowers mostly about midway of the branches or rachillae: fruit cream-colored, probably becoming purple, oblong-ovoid, about 4 cm.

long, sides nearly parallel, blunt at apex; nutlet enveloped in thin hair-like fiber, black, pores not of equal height on the surface.

Wet or swampy places, near Fort Sherman, Bay of Limón and apparently on Barro Colorado Island.

CANAL ZONE: Fort Sherman, Bay of Limón, Bailey 218.

It is not yet certain whether the Panama plant is the same as the *balanoidea* of Oersted, who got his palm at Puntarenas on the Pacific side of Costa Rica. Guatemalan material has also been referred here. Oersted did not have or describe the leaves of his plant; good recent collections at Puntarenas are required to determine the identities.



Fig. 54. *Bactris Augustinea*

12. *BACTRIS AUGUSTINEA* Bailey, Gent. Herb. 3:95. 1933. (excl. syn.)

Heavily spined, growing in dense clumps 3 m. tall; trunk 5-7 cm. thick, the conspicuous leaf-sheaths held together by encircling fibrous strands: leaves 1-2 m. long, regularly many-pinnate, petiole provided with dark brown angled spines 3-8 cm. long on sheath and shorter on rachis; pinnae 25 or more pairs, contiguous and evenly spaced, 30-45 cm. long and 2.5 cm. or less broad, grayish-green and nearly glabrous, margins spiculate,

midrib and side-ribs conspicuous: spathe or cymba about 25–30 cm. long, many-ribbed, pubescent and thickly aciculate; spadix with 10 or fewer branches near apex of peduncle, each 12–20 cm. long: fruit at first whitish, becoming dull purple, globular-oblong or indistinctly obovoid but becoming more or less conic when dry, 3–4 cm. long, glabrous, the scalloped cupule prominent; nutlet 2–2.5 cm. long, imbedded (when dry) in a mealy but firm mesocarp.

CANAL ZONE: in low ground near Summit, *Bailey* 437.

13. *BACTRIS MAJOR* Jacq. Select. Stirp. Amer. Hist. 1:280. 1763.

Pyrenoglyphis major Karst. Fl. Columb. 2:141. 1866.

Strong upright palm producing many stout canes 6–8 m. tall and 5 cm. thick that become free of thorns and are then white-ringed, very spiny on sheaths: leaves large, 2–2.5 m. long, dull green; pinnae 30 or more pairs, glabrous except finely setose on margins, 2–3 cm. or less broad, long-acuminate, 40–65 cm. long, midrib stout and lateral veins conspicuous: spadix 30–40 cm. long, the prominent compressed peduncle setose-spiny toward the top and soon downward-curved or goose-necked; cymba bearing scattered stiff hairs but practically glabrous on the surface, flower-cluster branching nearly or quite from its base and lacking a continuing rachis; pistillate flowers scattered along the rachillae and about 4 mm. across at anthesis, the corolla-cup hairy on its upper part, staminodes represented by an apron or membranous ring on inside of the cup: fruit ellipsoidal or elliptic-ovoid, 4–5 cm. long and 3.5–4 cm. thick, purplish when mature, becoming pointed or peaked when dry; cupule doubly crenate.

Apparently in Panama, along streams and arroyos; Colombia. The following determinations are not yet positive:

PANAMÁ: Río La Maestra, *Allen* 42; *Pittier* 6756. DARIÉN: *Pittier* 6620.

9. *ASTROCARYUM* G. Meyer

ASTROCARYUM G. Meyer, Prim. Fl. Esseq. 265. 1818.

Heavily armed monoecious pinnate-leaved palms, usually with tall erect single trunk but sometimes soboliferous and infrequently the caudex not developing into a bole (plant more or less acaulescent): leaves usually long, conspicuously ascending and overarching, irregularly and unequally pinnate, the pinnae frequently aggregate or clustered on the rachis: spadices interfoliar but lowest leaves sometimes falling before the fruits mature, consisting of a stout spiniferous peduncle that extends as an axis or rachis from the sides of which many usually simple short branches or rachillae extend, spadix at first inclosed in a long scarcely woody armed cymba-like spathe of 2 valves but which after anthesis is likely to hang as a dead member on a long peduncle and much longer than broad: flowers borne usually on the rachillae, the few pistillates at base and the numerous staminate compactly occupying the upper part, but sometimes the main rachis also bearing pistillate flowers on its upper part; staminate flowers 4–10 mm. long at anthesis,

with small calyx and much longer more or less tubular or gamopetalous corolla with valvate lobes, 6 exserted stamens with long versatile or erect anthers, minute pistillode sometimes present; pistillate flowers much larger, 12 or more mm. long, conic, envelopes usually connate; ovary 3-loculed: fruit a drupe-like body but mesocarp soon becoming dry or disappearing or remaining in fibrous elements, 3-8 cm. long, ovoid, obovoid or subglobose, variously beaked, smooth, asperulate or aculeate, 1- to 2-seeded, retaining the accrescent floral cup; nutlet with 3 often ornamented or radiate pores, albumen homogeneous, very hard, cavitous in center, raphe much branched.

Species about 50, island of Trinidad, Costa Rica, South America, largely in Brazil.

- a. Fruit unarmed: trunk very spiny: pinnae attached by narrow bases, not multiple: spines on leaf-rachis not winged. 1. *A. STANDLEYANUM*
 aa. Fruit aculeate: armature of trunk on bases of old leaves that carry the spines with them when they weather away: pinnae with very broad bases, multiple by division: spines on concave under surface of leaf-rachis very broad and thin-edged or alate. 2. *A. ALATUM*

1. *ASTROCARYUM STANDLEYANUM* Bailey, Gent. Herb. 3:88. 1933.

Erect stout tree, 12-15 m. tall; trunk to 20 cm. diameter, wood hard, armed with deflexed flattened spines 10-15 cm. long: leaves 2-4 m. long, glossy on upper surface, clustered into a close broad crown; pinnae numerous, irregularly placed on the rachis and often clustered, 1 m. long, 2-4 cm. broad, being long and narrow with parallel sides, glabrous or becoming so when a loose scurf falls, ridged with midrib on upper surface and showing more or less prominent lateral nerves, margins bearing small spicules; petiole 1 m. or more long, armed with retrorse flat prickles from 2 to 15 cm. long; spadix 50-60 cm. long at anthesis aside from the long terete armed peduncle, spathe black-spiny and soon becoming free and hanging or falling, rachillae



Fig. 55
Astrocarium Standleyanum

10-15 cm. long, in whorls or irregularly placed and at the base of which are 2 or 3 pistillate flowers 15-18 mm. long in the crooks of the branchlet; staminate flowers with long exserted versatile anthers 5-7 mm. long, closely set on extended part of branchlet, cream-colored: fruit globular-oblong-ovoid, 4-4.5 cm. long including the prominent beak, about 3 cm. thick, 1-seeded, orange, roughish-papillate, unarmed; nutlet about 2 cm. long, with longitudinal black stripes, pores with radiating lines.

Conspicuous forest tree in central Canal Zone and probably widely distributed.

CANAL ZONE: Barro Colorado Island, *Bailey 211*; Forest Preserve, *Allen 2537*, a form with fruits less than 4 cm. long and less than 3 cm. thick, leaf-margins only minutely setulose or practically nude.

2. *ASTROCARYUM ALATUM* Loomis, in Jour. Washington Acad. Sci. 29:142. 1939.

Tree 4-6 m. tall, 12-15 cm. diameter, the trunk without spines but the persistent bases of old leaves bearing spines and carrying the spines with them when eventually they wither away: leaves 6-7 m. long, widely spreading on long petioles and more or less arched, the petiole occupying one-third the length of leaf just stated; pinnae usually in closely placed clusters of 2-15 parts or segments,

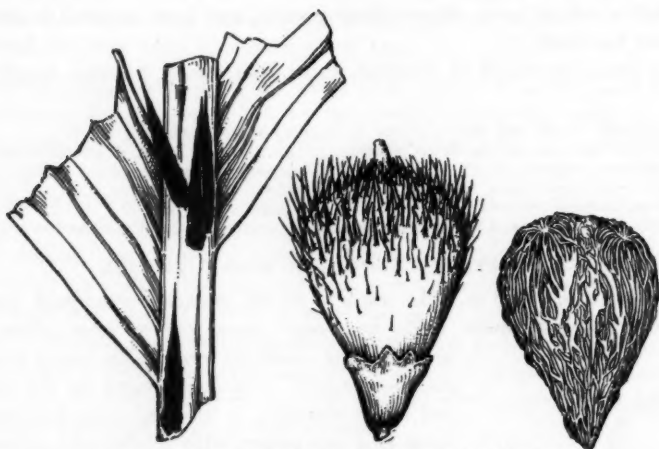


Fig. 56. *Astrocarium alatum* with bit of leaf rachis, fruit, nut.

the terminal segments confluent, basal pinnae 50-60 cm. long, middle pinnae 15-95 cm. long, width 3-6 or 7 cm., apices truncate or oblique and erose, upper surface glossy, under surface gray, strong nerves several to many and prominent, surfaces free of spines, under side of leaf-rachis at middle and base bearing appressed flat thin-winged spines 2-5 cm. long and 4-8 mm. broad: spadices erect or strongly ascending, as broad as long, flowering part 20-25 cm. long, the simple rachillae 16-18 cm. long; staminate flowers urceolate, 5-6 mm. long, the short basifixed anthers barely exserted: fruit obpyriform, 6-7 cm. long, 4 cm. broad near apex, angled on the lower part from pressure in the congested short spike, conic beak 7-10 mm. long, narrow base set in a deep floral cup, brownish-green becoming rusty, upper part pimpled and bearing brown-black hairs 12 mm. or less long, beak unarmed; when dry the thin shell breaks easily and discloses an angled nutlet 5-7 cm. long with 3 conspicuous radiated pores and surface marked with rapheal fibers.

Panama, Costa Rica. The species was founded on collections in the forest at Río Hondo, Plains of Santa Clara, Costa Rica, alt. 100 m., but known in that country in other places. Known as *Coquillo*.

CANAL ZONE: Quebrada Lopez, Allen 2111. COCLÉ: region north of El Valle de Antón, 800-1000 m., Allen 2535, 2720.

10. AIPHANES Willd.

AIPHANES Willd. in Mém. Acad. Sci. Berlin, 1804:32.

Marara Karst. in Linnaea 28:389. 1856.

Small or medium-sized very spiniferous monoecious irregularly pinnate-leaved trees with solitary or soboliferous armed trunks, spadices interfoliaceous: leaves pinnate and pinnatisect, spine-bearing on the long sheaths and petiole as well as usually on rachis and sometimes on under side of pinnae themselves, the pinnae usually broadest toward apex and cuneate at base, erose or dentate or jagged at the truncate or expanded summit, alternate or clustered on the rachis: spadix long and slender-branched, at first erect but becoming horizontal or pendent, attended by narrow more or less spiny spathe-valves that do not permanently inclose it and are not cymba-like: flowers small and numerous; staminate mostly on upper part of rachillae and pistillate on lower part but typically 1 pistillate between 2 staminate, sometimes an entire spadix mostly pistillate; sepals and petals 3 each, petals usually valvate in both sexes; stamens 6, in one group (*Macroanthera*) linear and flower-bud longer than broad, in the other group (*Brachyanthera*) very short and suborbicular and flower-bud as broad as long; ovary 3-loculed; staminodia in some species represented by a toothed cup: fruit a colored 1-seeded little drupe with either fleshy or firm mesocarp, globose or subglobose, usually 1-2 cm. thick, 1-seeded; nutlet or seed globular, rugose or pitted, albumen continuous and solid.

About 30 species, West Indies and South America, now first recorded in Panama. The recognized species until recently have been named in *Martinezia*, but that genus is a confused concept and does not apply to these plants. The generic name may be pronounced as if spelled *A-if'-an-ees*.

1. AIPHANES FUSCOPUBENS Bailey, Gent. Herb. 6:209. 1943.

Tree 5 m. tall, apparently not soboliferous, trunk covered with spines: leaves 2 m. long, more or less glossy; petiole short, bearing blackish plano-convex spines of different lengths some of which are 8 cm. long, and also shreds at the somewhat expanded base, the surface as well as that of the rachis showing much black hairy pubescence 1-3 mm. long; pinnae 20 or more either side the ridged rachis, 15-30 cm. long, 10 cm. broad at apex or some of them split into 2 or 3 narrower units, apex irregularly truncate and shallowly erose and toothed and sometimes the upper margin produced into a short sharp finger, sides straight and entire, many-nerved and lacking definite midrib, glabrous, surfaces bearing no spines: inflorescence erect; peduncle slender, 5-7 mm. thick, 1 m. and more long, armed with sharp prickles 15 mm. or less long, lower half inside narrow sparingly weak-prickly spathe-valves, upper or flowering free part 40-50 cm. long, axis angled and dark-pubescent, the simple slender branches or rachillae 30-40 cm. long and strongly ascending; flowers close together along the rachillae, the lower or pistillate ones lightly sunken in shallow cavities, the upper smaller staminate ones superficial; pistillate flowers about 4 mm. thick and 5-6 mm. long; staminate flowers in full bud about 3 mm. either way: fruit not seen.

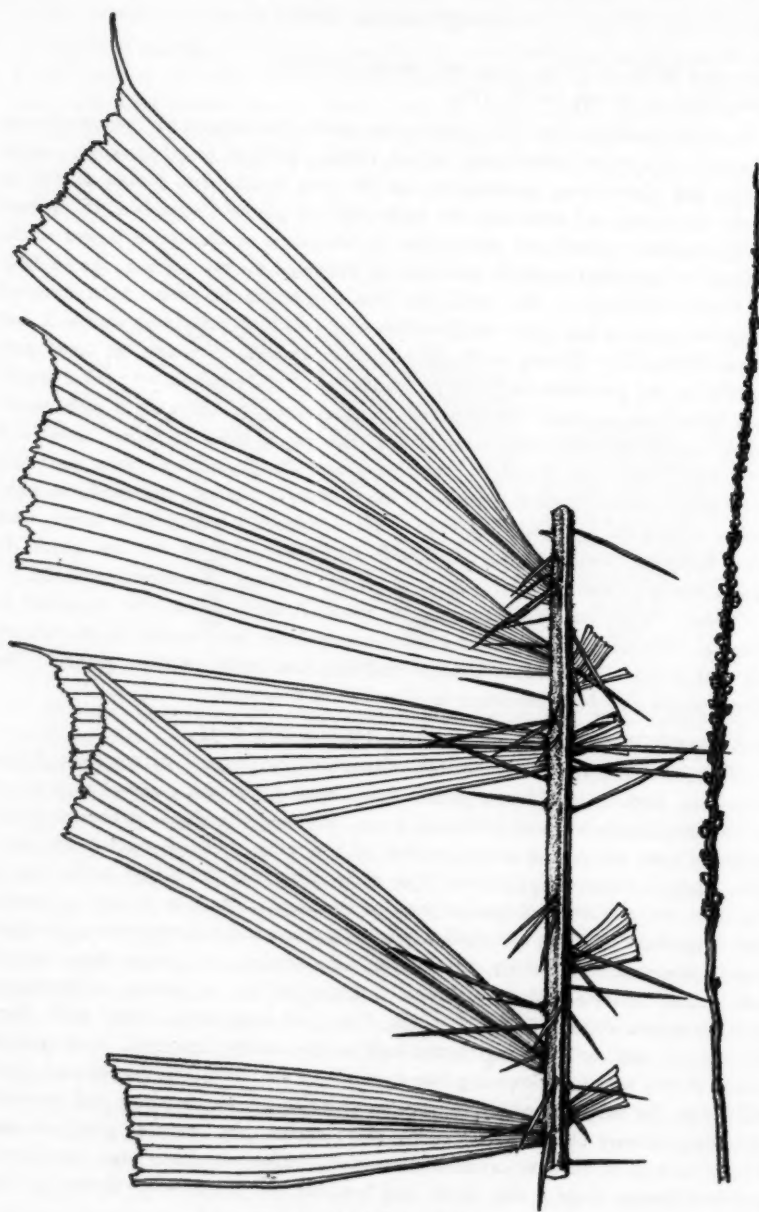


Fig. 57. *Alphonse fuscipubens*

(258)

PANAMÁ: cloud forest, on hills above Campana, 600-800 m., Allen 1870.

Readily distinguished by the dark or fuscous pubescence of flowering branches as well as less markedly of peduncle and leaf-rachis.

11. CHAMAEDOREA Willd. "Dorea Palms"

CHAMAEDOREA Willd. Sp. Pl. 4:638, 800. 1806. *Nomen conservandum*.

Nunnezharia Ruiz & Pav. Fl. Peruv. & Chil. Prodr. 147. 1794. *Nomen rejiciendum*.

Nunnezia Willd. Sp. Pl. 4:1154. 1806.

Stachyophorbe Liebm. in Oevers. Dansk Vid. Selsk. 1845:8. 1846.

Collinia Liebm. ex Mart. Hist. Nat. Palm. 3:308. 1849.

Stephanostachys Klotzsch ex Oerst. in Kjoeb. Vidensk. Meddel. 1858:26. 1859.

Spathoscaphe Oerst. op. cit. 29. 1859.

Eleutheropetalum Wendl. ex Oerst. op. cit. 6. 1859.

Dasytachys Oerst. op. cit. 25. 1859.

Kinetostigma Dammer, in Notizbl. Bot. Gart. u. Mus. Berlin 4:171. 1905.

Small dioecious unarmed palms, mostly arundinaceous with slender ringed or jointed canes or trunks: leaves pinnate, pinnatisect or pinnately veined, minute flowers of differing morphology not distinctly sunken in the rachis or only apparently so when crowded, the peduncles bearing few or several sheathing bracts or spathes that may fall or become shredded before fruiting and leave scars or rings that are marks of the genus: spadices inter- or infrafoliar: perianth-parts in two series of 3 each but variously connate and sometimes each series united into one body; stamens 6, often connate: fruit small, hard or thinly succulent only on the exterior, ellipsoid, oblong, somewhat pyriform, stigma basal, seed single, albumen plane (not ruminant).

About 100 species, from Mexico to Peru and Brazil, not in the West Indies, a few of them grown in conservatories for ornament and sometimes planted in warm countries. They are mostly woods palms, favoring moist or shaded conditions.

Chamaedorea is a troublesome genus to the taxonomist because the species are so many, numbers of them local, marks between them often technical and close, both sexes not likely to be represented in collections, and the original descriptions often so brief or inadequate as not to be identifiable. The species may be confused with the *Geonomas*, but the two genera are distinct and are readily distinguished by the multiple spathes or bracts on the peduncle of *Chamaedorea*, by absence of scars on the same rachilla representing two sexes, and lack of sunken pits where flowers and fruits are borne, the scars or placements being single and simple rather than two or three together. The Dorea Palms abound in sigmoid pinnae or lobes, curving in opposite directions like the long or old-fashioned letter S or the Greek letter Σ, the two sides not being the same and the veins strongly incurved at base. In some cases the pinnae are falcate rather than sigmoid, the two sides not greatly unlike and not bulging or gibbous, and ribs little if at all incurving at base.

a. Leaf simple (of one piece), bilobed at apex.

b. Margins of leaf entire or not serrate.

bb. Margins deeply serrate.

aa. Leaf pinnate, with several or many pinnae.

1. *C. TERRAYORUM*

2. *C. COCLENSIS*

- b. Rachillae of pistillate spadix very short, not more than 4 cm. long, and the upper ones much shorter..... 3. *C. BRACHYCLADA*
- bb. Rachillae much longer.
- c. Leaf-segments or pinnae not sigmoid or falcate or with curved and unequal sides, tapering straightway to apex.
- d. Pinnae above 30 cm. long, 3-5 cm. broad..... 4. *C. WOODSONIANA*
- dd. Pinnae 25 cm. or less long, 2 cm. or less broad..... 5. *C. SEIBERTII*
- cc. Leaf-segments or pinnae not straight but with bulging or unequal sides, more or less sigmoid or falcate, mostly curved at the end, broadest at about the middle, veins usually curving to narrowed base.
- d. Pistillate spadix a simple much-congested spike: pinnae about 9 pairs, equally spaced..... 6. *C. ALLENI*
- dd. Pistillate spadix branched (of 2 or more rachillae).
- e. Plant acaulescent and very small, usually not exceeding 1 m. tall over all and commonly much less: pinnae small, 7-9 or more pairs.
- f. Pinnae 17 cm. or less long and one-third as broad: staminate spadix or cluster branched from near top of peduncle and therefore lacking a continuing rachis..... 7. *C. MICROPHYLLA*
- ff. Pinnae of similar length as in f but only one-fifth as broad as long: staminate spadix with a continuing rachis and the rachillae therefore lateral..... 8. *C. PYGMAEA*
- ee. Plant caulescent, the trunk or cane itself usually 1 m. or more tall: leaves various, pinnae 20 cm. or more long.
- f. Pinnae prominently broad, 6-13 cm. wide, markedly sigmoid.
- g. Apex of pinnae produced into slender tail-like points: pinnae about one-third as broad as long..... 9. *C. LUCIDIFRONS*
- gg. Apex of pinnae acuminate, not caudate: widest pinnae nearly or quite one-half as broad as long.
- h. Main nerves of pinnae many and prominent, usually a dozen or more: pinnae thin, brittle and papery..... 10. *C. LATIPINNA*
- hh. Main nerves of pinnae fewer, usually not more than 6, and not outstanding: pinnae of good substance: fruit black..... 11. *C. FLAVOVIRENS*
- ff. Pinnae prominently narrow or at least not very broad, one-fourth or less as broad as long.
- g. Length of pinnae 30 cm. or less, the nerves or ribs not very pronounced.
- h. Petiole slender, usually 10 cm. or more long, not suddenly expanded at base.
- i. Shape of pinnae much broader than linear and noticeably sigmoid.
- j. Rachis of leaf-blade without long vacancies on one side or the other due to absence of pinnae (which are more or less paired even though opposite).
- k. Apex of pinnae narrowing to very slender curved long point or cauda: fruit yellow..... 12. *C. PACAYA*
- kk. Apex of pinnae narrow but not curved..... 13. *C. HAGENIORUM*
- jj. Rachis with long nude space on one side or the other due to absence of two or three pinnae; apex acuminate but upwardly curved..... 14. *C. WEDELIANA*
- ii. Shape of pinnae long-linear, not more than one-fifth as broad as long, only indifferently sigmoid..... 15. *C. LINEARIA*
- hh. Petiole very short and stout, only 3-4 cm. long, concave on upper face, with quickly expanded striate base..... 16. *C. PITTIERI*
- gg. Length of pinnae 30 cm. and more, the nerves or ribs conspicuously parallel and prominent.
- h. Width and length of pinnae uniform or nearly so along the rachis.

- i. Upper half of pinnae strongly falcate, usually caudate.....17. *C. WENDLANDIANA*
- ii. Upper half of pinnae not markedly curved or falcate.....18. *C. SCHERYI*
- hh. Width, and sometimes the length, of pinnae very uneven or irregular on the same blade.....19. *C. FALCARIA*

1. *CHAMAEDOREA TERRYORUM* Standl. in Field Mus. Bot. Ser. 22:326. 1940.

Small, practically acaulescent, the brief caudex being covered by leaf-bases, 30–40 cm. tall but perhaps reaching 75 cm.: leaf-blade 20–30 cm. long and 9–15 cm. broad, glabrous, simple, cuneate-obovate, deeply bilobed at apex with the lobes acuminate, main veins many and prominent, 5–10 mm. apart, intermediate veins many and obscure, rachis 12–16 cm. long and blade long-narrowed to base; petiole 11–25 cm. long, slender, striate: spadices radical, long-peduncled but shorter than the leaves and conspicuously sheathed; staminate spadix with a continuing straight rachis and 16 or more diverging very slender rachillae 3–6 cm. long and loosely flowered; pistillate spadix and fruit not described.

Panama.

DARIÉN: on Cana-Cuasi trail, Chepigana District, *Terry & Terry 1452*.

2. *CHAMAEDOREA COCLENSIS* Bailey, Gent. Herb. 6:236. 1943.

Slender, 1.5 m. tall, the sheathed stem or culm 1 cm. or less thick, rings or nodes 4–5 cm. apart: leaves very few, simple and deeply 2-lobed at apex, blade 30–40 cm. long and 20 cm. wide, broadly obovate in outline, cuneate to base, outer margins on upper half conspicuously serrate or serrate-dentate, glabrous, glossy at least underneath, rachis prominent as a midrib particularly underneath, main lateral ribs about 25 on each side and 5 mm. apart and ending in sinuses of the serratures, prominent on upper face: staminate spadices few from separate nodes beneath the leaves, ascending, peduncle 10–12 cm. long and the bracts soon shedding; rachillae 6 or 7 from near apex of peduncle, 12–15 cm. long, closely ascending, glabrous, strongly angled in drying, rather closely flowered; staminate flower-buds just preceding anthesis about 1 cm. across, obtuse or somewhat flattened, calyx a connate cup without evident lobes, petals valvate; pistillate sex unknown: fruit oblong, blunt, 12–13 mm. long and 9–10 mm. broad, smooth and glossy, the thin skin soon shattering.

Panama.

COCLÉ: vicinity of El Valle de Antón, alt. 600 m., *Allen 1815*.

3. *CHAMAEDOREA BRACHYCLADA* Wendl. in Gartenfl. 29:101. 1880.

Trunk very short, 2–3 cm. thick, closely ringed: leaves about 3, erect, pinnate, somewhat more than 1 m. long, sheath short and tubular; petiole 40–50 cm. long; pinnae or segments 20–25 on either side the rachis, linear-lanceolate, acuminate, the lower margin decurrent, the large ones 30 cm. long and 2–2.5 cm. broad, with 5 nerves and those on lower surface rough: pistillate spadix infrafoliar, long-peduncled and spreading with 7 tubular spathes; rachis about 10 cm. long, much branched, the branches or rachillae 60–70, filiform and flexuose, much spreading, 4- to 7-flowered, the large flowers yellow-green, calyx very short, petals erect and

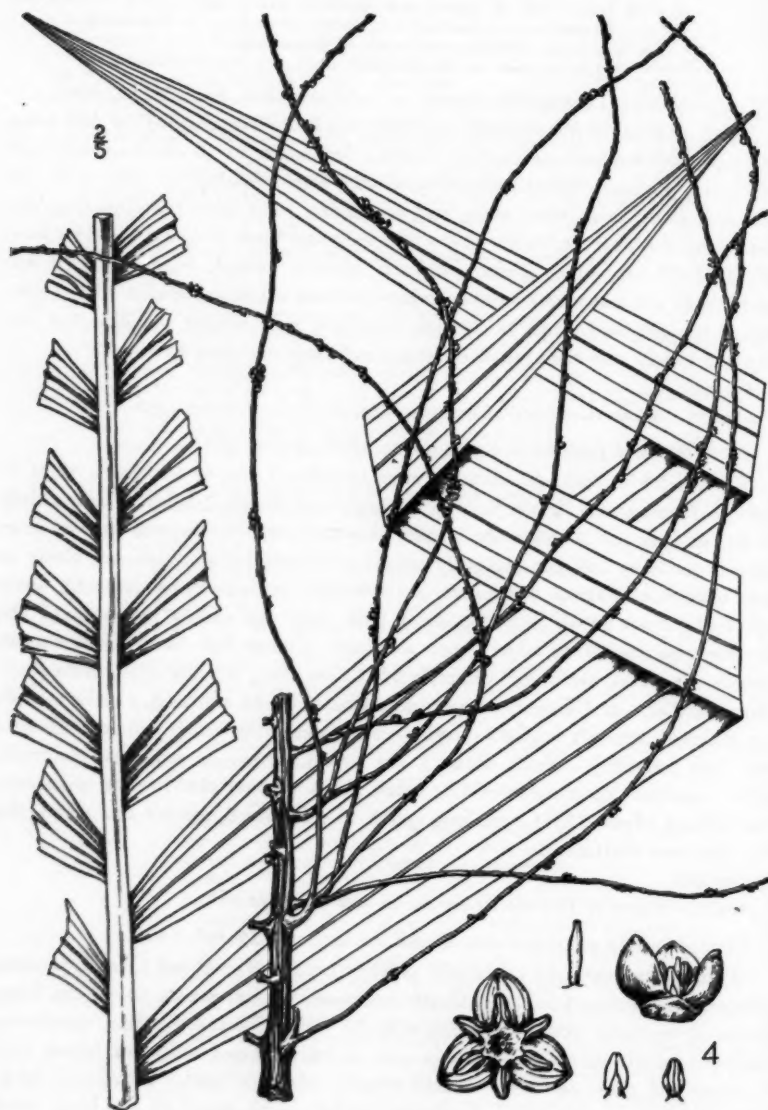


Fig. 58. *Chamaedorea Woodsoniana*

convolute-imbricate.

Grown in Europe from seeds sent from Chiriquí by Zahn; fruit and staminate spadix not described.

4. *CHAMAEDOREA WOODSONIANA* Bailey, Gent. Herb. 6:238. 1943.

Stout, 5-12 m. tall, slender: leaf-blade 1 m. long, with 20 or more pairs of opposite or subopposite long and large glabrous dark green pinnae; petiole 20 cm. and more long above the sheath, strongly ridged on top and more or less triangular in cross-section; sheaths 30 cm. and more long, stoutly many-striate, 3-4 cm. broad at middle, clasping the cane, narrowly winged at apex; main pinnae 60-65 cm. long, 3-5 cm. broad or the upper ones less than 2 cm., gradually and straightly tapering into long narrow ends or the young upper ones slightly curved but not sigmoid and caudate, all conspicuously ribbed particularly underneath, the central rib more pronounced than the 2 others on either side, intermediate nerves not prominent, the 5 main ribs 5-7 mm. apart; staminate spadix or truss large and diffuse in anthesis, 75 cm. and more long and very broad, on a many-sheathed peduncle 30-65 cm. long, sheaths soon shreddy; rachillae numerous, slender and flexuose, glabrous, simple or some of them once or twice forked, 20-50 cm. long, laxly flowered; pistillate spadix much like the staminate but rachillae fewer, shorter and less diffuse, 12-20 of them 10-30 cm. long: fruit globular, 8-10 mm. thick in mature dry state, somewhat fleshy on exterior, becoming wrinkled and reticulate in drying, cupule about 6-7 mm. across and with very broad lobes.

Panama; probably in Costa Rica.

Coclé: vicinity of El Valle de Antón, alt. about 600 m., *Allen 1901*. CHIRIQUÍ: in vicinity of Casita Alta, Volcán de Chiriquí, alt. 1500-2000 m., *Woodson, Allen & Seibert 948*.

5. *CHAMAEDOREA SEIBERTII* Bailey, Gent. Herb. 6:238. 1943.

Very slender, canes 1-2 cm. thick, ringed at intervals of 2-8 cm., plant 2 m. tall: leaf-blade 50-90 cm. long, bearing 16-24 alternate or subopposite pairs of very narrow glabrous many-nerved straight pinnae; petiole slender, angled, 12-14 cm. long above the tight closed finely striate sheath which is 18-20 cm. long; pinnae light green, thin, 20-25 cm. long and 1-2 cm. broad, tapering regularly to a long slender point which is often broken away, somewhat narrowed to base, standing 2-3 cm. apart on the very slender flattened rachis, with straight prominent midrib and several side-nerves close together: pistillate spadix composed of about 6 orange-colored branches or rachillae 6-12 cm. long issuing from a rachis only 4 or 5 cm. long, the slender reddish-orange peduncle 14-15 cm. long bearing 3 or 4 sheaths that soon become shreddy and fall at fruiting time and leave the ringed scars of their attachment: fruit globular, 7-8 mm. thick when dry and deeply wrinkled from the shrinking of the thin flesh, green or olive-green when fresh; cupule small, 4-5 mm. in expansion, deeply lobed.

Panama.

CHIRIQUÍ: valley of the upper Río Chiriquí Viejo, vicinity of Monte Lirio, 1300-1900 m., *Seibert 218*; vicinity of Callejón Seco, Volcán de Chiriquí, alt. 1700 m., *Woodson &*

Schery 502; slope of Cerro de la Horqueta, *Pittier 3189*; Sabana de El Salto, eastern slope of Volcán de Chiriquí, *Maxon 5272*.

6. *CHAMAEDOREA ALLENII* Bailey, *Gent. Herb.* 6:241. 1943.

Erect, 2 m. tall: leaves uniformly pinnate, blade 60–70 cm. long, glabrous, firm in texture, more or less glossy; petiole about 30–35 cm. long above narrow sheath, ridged and striate, 5–7 mm. broad; pinnae alternate or subopposite, about 9 pairs, equally spaced and not more than 3 or 4 cm. apart, terminal pair confluent, 25–30 cm. long, 3–6 cm. broad, narrow-lanceolate and not sigmoid, somewhat narrowed to base, acutely acuminate to caudate, prominently about 9-ribbed, main ribs 4–7 mm. apart, light-colored and pronounced on under surface, nearly confluent at base: spadix a single simple very dense spike about 8 cm. long at anthesis, on a peduncle 24 cm. long and which is completely contained in about 4 loose sheaths of which the uppermost is projected 3–4 cm. with an acuminate herbaceous end; pistillate flowers in 8 rows, bright yellow, so closely placed as to appear to be immersed in the rachis; calyx a shallow more or less undulate but not lobed cup in which loosely sit the 3 introrse petals inclosing the conic more or less 3-lobed ovary on which the 3 spreading or reflexed prominent stigmas are sessile; staminate spadix and fruit not seen.

Panama.

COCLÉ: north rim of El Valle de Antón, *Allen 1909*.

7. *CHAMAEDOREA MICROPHYLLA* Wendl. in *Bot. Zeit.* 17:102. 1859.

Trunk simple, slender, erect, usually 1 m. or less tall, reported to 2 m., to 15 mm. thick, rings 4–7 cm. apart, surface white-spotted or punctate and somewhat glaucous: leaves 3–4, minutely punctate, about 45–50 cm. long, pinnate, the pinnae 7–9 pairs alternate or subopposite; sheath 7–9 cm. long; petiole about 10 cm. long, nearly terete but lightly grooved toward base; pinnae at the middle of rachis 14–17 cm. long and 3–4 cm. broad, oblong-lanceolate and sigmoid-curved, abruptly short-acuminate, contracted to base, midrib strong as well as 2 side-nerves, lowest pair of pinnae lanceolate and long-acuminate and somewhat reflexed, the upper pair confluent at base: spadix infrapetiole; staminate spadix once-branched or one or two of the rachillae forked near base, rachis 8–10 cm. long and not straightly continued through the cluster, the angled slender rachillae about 15, laxly flowered, 10–18 cm. long; pistillate spadix with rachis 6–7 cm. long and not continued, rachillae 7–12, simple or some of them forked near base, 4–8 cm. long, slender and flexuose.

Grown long ago under glass in Europe from seed collected by Warscewicz in Chiriquí, Panama; fruit not described. The Costa Rican plant that passes as this species is probably *C. pygmaea* Wendl.

8. *CHAMAEDOREA PYGMAEA* Wendl. ex Dammer, in *Allgem. Gartenzeit.* 20:217, 249. 1852.

Stachyophorbe pygmaea Oerst. in *Kjoeb. Vidensk. Meddel.* 1858:10. 1859; *l'Amer. Cent.* 14: t. IV, f. 1–16. 1863.

Plant practically acaulescent, 60–80 cm. high over all, the caudex of 6–8 cm. being covered with bracts and leaf-bases and less than 2 cm. thick at surface of ground: leaves pinnate, 40–50 cm. long, of 10–12 pairs of opposite or subopposite glabrous thin pinnae that are 10–18 cm. long and 2 cm. or less broad, lower ones often shorter and narrower; pinnae gradually narrowed to acuminate apex and also narrowed to half the width at base, sigmoid-lanceolate, midvein prominent, 1 or 2 laterals on either side semi-prominent: spadices radical, the slender peduncle tubular-bracted or spathe, shorter than the foliage, laxly flowered; staminate spadix about 10 cm. long and 7 or 8 cm. broad, rachis continuous and emitting 20–30 spreading slender rachillae 4–5 cm. long; pistillate spadix simple or of very few branches 5–8 cm. long.

Chamaedorea pygmaea was based on plants from Colombia; the species occurs also in Costa Rica. It is variable in the width and size of pinnae as well as in the veining. It has been confused with *C. microphylla*.

DARIÉN: on Cana-Cuasi trail in Chepigana District, Terry & Terry 1453. CHIRIQUÍ: epiphytic in vicinity of Bajo Mona and Quebrado Chiquero, Woodson & Seberry 585, rachis orange, fruit purple and globular, about 8 mm. diam.

9. *CHAMAEDOREA LUCIDIFRONS* Bailey, Gent. Herb. 6:244. 1943.

Slender, 2.5 m. tall: leaf-blade 40–50 cm. and more long, glossy and glabrous, with several very broad strongly ribbed alternate pinnae; rachis convex on the back, lightly ridged on upper face; pinnae 30–35 cm. long, 6–9 cm. broad, lance-oblong and strongly sigmoid, tapering to narrow point or to a cauda, with 7–15 conspicuous costa standing 4–10 mm. apart at the middle and prominently curved to the narrowed base, lucid particularly on the lower face: pistillate spadix once-branched from a short rachis, about 22 cm. long and nearly as broad, the glabrous rachillae 10–20 cm. long and divaricate or upwardly curved: fruit small, short-oblong, obtuse, 5–6 mm. long, 4–5 mm. thick, irregularly and shallowly wrinkled in drying; cupule small, the lobes spreading.

Panama.

COCLÉ: vicinity of El Valle de Antón, alt. about 600 m., Allen 1814.

10. *CHAMAEDOREA LATIPINNA* Bailey, Gent. Herb. 6:244. 1943.

Slender, 1 m. tall, with smooth glossy foliage: leaf-blades 30–50 cm. long, pinnate, apical part with 2 very broad confluent lobes, other pinnae alternate, few in number; rachis very thin and flattened, 2–3 mm. broad, ridged on top; pinnae thin, 25–30 cm. long, 10–13 cm. broad, strongly sigmoid, rather abruptly contracted to a short point, base very wide, conspicuous because of several or many curved strong ribs 1 cm. or more apart and less distinct ones between: spadices once-branched from a more or less continuing central axis; peduncle 25 and more cm. long, its length inclosed in striate sheaths; staminate spadix 25–30 cm. long and nearly as broad, the glabrous rachillae 18–25 cm. long and laxly flowered; staminate flowers with broad deeply lobed lightly imbricate calyx; pistillate spadix somewhat smaller, the fertile part about 20 cm. across in either direction: fruit

(immature) oblong and contracted to base, obtuse at apex, 10–12 mm. long, green in color.

Panama.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, von Wedel 2275.

11. *CHAMAEDOREA FLAVOVIRENS* Wendl. in Index Palm. 60. 1854.

Very slender, 2.5 m. tall with a more or less crooked trunk or cane about 1 cm. thick and rings 5–6 cm. apart, foliage yellowish-green: leaf-blade 30–35 cm. long, glabrous, somewhat lustrous, pinnate, rather thin and papery in texture; pinnae about 5 on either side, broadly oblong-acuminate, the terminal pair or bilobe much the broadest and the sinus more or less obtuse, others alternate, all sigmoid, short and rather abruptly contracted to an up-curved acumen, 15–20 cm. long, 4–6 cm. broad and the upper pair 8 cm., broader ones with 4–6 curved nerves and thinner ones between and not very arresting nor ridged even though prominent; petiole slender, about 20 cm. long above the conspicuously striate sheath, very narrowly channelled on upper face: pistillate spadix about 15 cm. long in fruit, of 5 or 6 ascending branches arising from near the top of the compressed about 5- or 6-bracted slender peduncle: fruit essentially globular or very short-oblong, black and glossy, somewhat fleshy, 1 cm. long when dry and mature and 8 or 9 cm. thick, obtuse, smooth but wrinkling in drying; cupule small and not prominent, outer series saucer-like, inner series lobed; seed contained in a striate case or shell, brown outside and inside, micropyle at base.

PANAMÁ: Cerro Campana, trail from Campana to Chica, alt. 600–800 m., Allen 2644.

This species is distinguished from *C. Pacaya* Oerst. by the much broader, more sigmoid, less pointed and more sparsely nerved pinnae; fruit black rather than yellow.

12. *CHAMAEDOREA PACAYA* Oerst. in Kjoeb. Vidensk. Meddel. 1858:12. 1859.

Chamaedorea Oerstedii Cook, in Nat. Hort. Mag. 18:168. 1939.

Slender, 2–3 m. tall, erect or somewhat flexuose, remotely ringed, trunk cane-like and about 15 mm. thick: leaves pinnate, 70–100 cm. long, glabrous; petiole sheath striate, about 12–13 cm. long; pinnae 5–7 pairs, alternate or subopposite, dull green and thin, more or less plicate, middle ones 15–20 cm. long, 3–4 cm. broad at middle and the terminal pair or lobes broader, tapering both ways and broadest at middle, sigmoid or broad S-shaped, the point long and very narrow or even caudate, one rib or midrib prominent and two or three thinner ones on either side, upper margin of terminal lobes sometimes serrate as if indicating the beginning of splitting: spadix with slender and compressed peduncle 30–50 cm. long, rachis 3–4 cm. long; rachillae 5–10, glabrous, 5–10 cm. long, ascending or spreading: fruit obliquely obovoid, about 10–12 mm. long, somewhat narrowed or one-sided to base, obtuse at apex, yellow at maturity, somewhat wrinkled in drying from shrinking of slightly fleshy mesocarp, stigmatic mark showing on flat side near base.

Panama; collected originally at Mt. Jaris, Costa Rica.

CHIRIQUÍ: Quebrada Chiquero, Woodson & Schery 586; Bajo Chorro, Woodson & Schery 681, 702; Davidson 36; Quebrada Velo, Woodson & Schery 270. CANAL ZONE: Quebrada Lopez, Allen 2119.

Since the vernacular name *Pacaya* is applied to several *Chamaedorea*s and also to other palms in Latin America, the binomial *C. Pacaya* also is often misapplied and misinterpreted, and care must be exercised in the identification of the particular species.

13. *CHAMAEDOREA HAGENIORUM* Bailey, Gent. Herb. 6:247. 1943.

Tree-like, to 1 m. or a little more tall, glabrous, foliage more or less glossy; leaves regularly pinnate, the blade 35-40 cm. long and 25 or more cm. broad; pinnae alternate, 5 or 6 on either side, narrowly oblong-lanceolate and gradually narrowed into straight tips, 15-20 cm. long, 2-3 cm. broad at middle or the terminal pair to 4 cm. broad, midrib not much stronger than the 2 or 3 parallel nerves on either side, all nerves converging somewhat toward base but the pinna not sigmoid; petiole 12-18 cm. long above the sheath, strongly ridged and angled as is the rachis; pistillate spadix small, of about 3 striate and angled erect glabrous rachillae 7-8 cm. long from the top of a very slender peduncle that is inclosed tightly in about 3 sheaths of which only the uppermost has a foliaceous end; sepals of pistillate flower very short and connate at base; petals much larger, nearly or quite free, imbricate, strongly nerved, pointed, soon spreading and chaff-like; pistil after fecundation short-oblong, obtuse.

Panama.

CHIRIQUÍ: cloud-forest at 6500 feet on Cerro de la Horqueta, Boquete region, von Hagen & von Hagen 2060.

Readily distinguished by its narrowly long-pointed or almost caudate leaflets and prominent loose petals of the pistillate flower, as well as by the short few branchlets of the inflorescence and lack of continuing rachis.

14. *CHAMAEDOREA WEDELIANA* Bailey, Gent. Herb. 6:247. 1943.

To 3 m. tall, very slender: leaf-blade 40-50 cm. long, thin, bright green both sides, pinnate, terminal part bilobed at apex and imperfectly 2-pinnatisect on either side; pinnae alternate and spaced 3-9 cm. apart on the rachis, lanceolate or broad-lanceolate or lanceolate and sigmoid, 16-22 cm. long, 3-6 cm. broad at middle, slenderly acuminate, considerably narrowed to base, strongly 4- to 5-ribbed and with indistinct veins between; petiole very short, about 6 or 7 cm. long above the sheath, striate, 3-4 mm. broad; rachis somewhat flattened, about 2 mm. broad; spadix slender and small; peduncle 30-40 cm. long, compressed, 3-4 mm. broad, bearing 5 or 6 sheaths; fruiting part terminal or nearly so, the rachis only 2-3 cm. long; rachillae 5, slender, 12-15 cm. long, loosely flowered: fruit ellipsoid, 12-14 mm. long, 6-7 mm. thick, tapering both ways, not fleshy and scarcely roughened in drying; cupule 3-lobed, not greatly enlarged, lobes spreading and striate inside, often remaining on the rachis.

Panama.

BOCAS DEL TORO: a "terrestrial shrub," Water Valley, von Wedel 719.

15. *CHAMAEDOREA LINEARIA* Bailey, Gent. Herb. 6:249. 1943.

Erect, slender, more or less 3 m. tall, culm about 1.5 cm. thick, internodes 2-3 cm. and more long, rings prominent: leaves long-pinnate, blade 30-45 cm. long and 20 cm. and more broad, glabrous; pinnae long-linear, alternate but close together, 15-20 or more either side the rachis, 25-30 cm. long, 2-3 cm. broad, not sigmoid but acuminate apices somewhat falcate, midrib pronounced and few side veins also noticeable, veins not clearly curved, base narrow and with nearly straight veins; petiole sheath 20 or more cm. long, strongly striate: staminate spadix with rachis 12-15 cm. long and about a dozen lateral slender glabrous spreading or drooping rachillae 10-12 cm. or more long; peduncle 20-25 cm. long, sheaths about 5 of which the terminal one is open and with a conspicuous bract; staminate flowers closely placed, about 1 mm. high just preceding anthesis and somewhat broader; calyx a shallow nearly entire cup; 3 petals valvate.

Panama.

CHIRIQUÍ: forests around El Boquete, 1000-1300 m., Pittier 2922.

16. *CHAMAEDOREA PITTIERI* Bailey, Gent. Herb. 6:252. 1943.

Erect, 60-100 cm. and perhaps more, the short caudex covered in the very expanded striate leaf-bases, at length becoming more or less evident from the falling of the leaves which are at the top of the broadened base and disclose strong rings 2-3 cm. apart, the culm itself about 1 cm. thick: leaves pinnate, glabrous or only minutely puberulent underneath, the blade 25-30 cm. long; petiole above the sheath very short, only 3-4 cm. long, stout, striate, grooved on upper face; rachis strongly ridged; pinnae alternate, narrowly lanceolate-acuminate, not sigmoid, firm, somewhat glossy at least underneath, 11-15 cm. long, 2.5 cm. or less broad at middle, long point sometimes almost caudate, tapering gradually to base, prominently and strongly many-nerved, the midrib usually not pronounced the whole length: peduncle arising from a central or upper axil, often 40 cm. long, slender, closely sheathed in 3 bracts; pistillate rachillae 2 or 3, erect or ascending from top of peduncle, 10-15 cm. long, alternately flowered; calyx small, lobed nearly or quite to base; petals separate, imbricate, somewhat striate: fruit oblong, obtuse, about 1 cm. long and 6 mm. broad, the soft thin exterior drying into more or less longitudinal lines, 3 micropyles prominent near basal end; cupule small, of flaring lobes.

Panama.

CHIRIQUÍ: southern slope of Cerro de la Horqueta, about 1700 m., Pittier 3168, 3169; rain forest, Bajo Chorro, Boquete District, alt. 6000 feet, Davidson 188.

A well-marked species in its very short petioles that are markedly expanded at base, narrow long-pointed strongly nerved pinnae, few short rachillae at top of very long axillary peduncle, fruit with prominent micropyles.

17. *CHAMAEDOREA WENDLANDIANA* (Oerst.) Hemsl. in Biol. Cent.-Amer. Bot. 3:407. 1885.

Stephanostachys Wendlandiana Oerst. in Kjoeb. Vidensk. Meddel. 1858:28. 1859.

Slender, 7 m. tall; trunk arundinaceous, green, about 3.5 cm. thick, bearing pronounced definite rings 3-4 cm. apart: leaves about 4, comprising the crown, irregularly pinnate, glabrous or perhaps slightly furfuraceous on nerves underneath, thin, glossy on upper surface, blade 1 m. and more long; pinnae 30-40, each 30-50 cm. long and 2-8 cm. broad, wide at attachment to rachis, long-acuminate to more or less falcate very narrow ends, the strong ribs 5-7 mm. apart; petiole 1 m. in length, long-sheathing, strongly angled, ridged on upper surface: spadix once-branched from the terete rachis, rachilla and rachis salmon-red, the glabrous rachillae strongly divaricate and 10-15 cm. long, peduncle 15 cm. more or less long and jointed and terete like a quill; alveoles or pits very shallow so that flowers and fruits are practically superficial: fruits oblong, 14-16 mm. long, and one-half as broad, green but turning black at maturity, obtuse, glabrous, the thin flesh making longitudinal ridges in drying; seed very hard, with homogeneous albumen.

Panama, Nicaragua, Costa Rica.

CANAL ZONE: Barro Colorado Island, Bailey 32, 146; Upper Río Pequini, Madden Lake area, vicinity of Police Station, Fairchild & Jobbins 2638; Cerro Campo, trail from Campana to Chica, Allen 2643.

18. *CHAMAEDOREA SCHERYI* Bailey, Gent. Herb. 6:252. 1943.

Low, nearly stemless: leaf-blade long-pinnate, about 1 m. long, bearing 18-20 opposite or subopposite pairs of glabrous much ribbed pinnae; petiole 30 cm. or more long, much ribbed or ridged, glabrous; pinnae falcate or sigmoid-lanceolate, 20-25 cm. long and 3-4 cm. broad, midrib pronounced on upper surface, 2 minor ribs either side and indistinct nerves between, apex slenderly acuminate to almost caudate, base narrowed to about one-half the usual width but ribs hardly curved, the pairs standing 3-4 cm. apart on the thin flattened rachis: staminate spadix ample and diffuse, the flowering part about 25 cm. long and broad, consisting of a continuing central glabrous rachis and perhaps 24 slender divaricate or drooping simple rachillae 10-15 cm. long and closely flowered; peduncle 50 cm. or more long, erect, slender, inclosed in about 5 strongly striate sheaths, the upper one of which has a short acutely bifid end; staminate flowers 1-2 mm. long in full bud, divaricate, abruptly short-pointed, calyx 3-lobed and spreading, petals valvate.

Panama.

CHIRIQUÍ: vicinity of Bajo Chorro, alt. 1900 m., Woodson & Schery 680.

19. *CHAMAEDOREA FALCARIA* Bailey, Gent. Herb. 6:254. 1943.

Very slender, about 3 m. tall; trunk 1-1.5 cm. thick, rather closely irregularly ringed: leaf-blade 75-80 cm. long, with a pair of broad pinnae at base, another pair at apex and about 5 pairs of narrower ones between; petiolar sheath 20-25 cm. long (perhaps more), narrow and close-fitting, many-striate; rachis about 40 cm. long to base of upper bilobed part, flattened but slightly ridged above, more or less furfuraceous; lowest and apical pinnae about 30-40 cm. long and 5 or 6 cm. broad, narrowed to long slender point, not sigmoid but falcate in the

upper half, not narrowed nor the ribs curved to base, stoutly marked by 5 or 6 ribs 6-10 mm. apart with noticeable finer veins between, cross-veined on upper surface, practically glabrous on both faces; intermediate pinnae 1-4 cm. broad, falcate above the middle: fruiting spadix simply branched from a continuing rachis, about 20 cm. long and broad, the glabrous rachillae 12-16 cm. long; peduncle 4-5 cm. long, with about 3 joints where spathe-bracts have fallen: fruit oblong, 9-10 mm. long and 5 mm. thick, glabrous, nearly obtuse at apex, indistinctly striate when dry; cupule very small.

Panama.

COCLÉ: hills north of El Valle de Antón, alt. about 800 m., *Allen 2949*.

12. ROYSTONEA Cook. "Royal Palm"

ROYSTONEA Cook, in *Science*, ser. 2, 12:479, in note. 1900; *Bull. Torr. Bot. Club* 28:549. 1901.

Oreodoxa Kunth in *HBK. Nov. Gen. et Spec.* 1, quarto ed.:305; and folio ed. 1:244. 1815; not Willd.

Gorgasia Cook, in *Nat. Hort. Mag.* 18:112. 1939.

Very tall majestic columnar monoecious spineless feather palms, bearing a long crownshaft at apex of woody bole and at the base of it clusters of flowers and fruits, that is inflorescence and infructescence infraxillary; trunk variously swollen, lightly ringed: leaves caducous from base of crownshaft; crown comprised of a large spreading or drooping canopy of many long leaves with drooping narrow pinnae and at the apex a long projecting sword-like unfolded new leaf: spadices at first erect or ascending, usually 2 or more together, comprised of 2 cymbae or spathes that eventually open on one side to liberate the cluster and to discharge the abundant meal (not pollen) within, one cymba falling early and often not observed, the inner much longer pointed cymba falling later with a crash or often hanging as a dead dry stave; spadix much branched, white, mealy, eventually becoming glabrous or retaining more or less pubescence: flowers scattered on the rachillae, not sunken, normally 1 pistillate between 2 staminate; sepals 3, very short, imbricate; petals longer, valvate; stamens mostly 6; pistil of 3 carpels, only 1 of which commonly develops into a globular or bean-like drupe-like 1-seeded fruit not exceeding about 2 cm. in longest diameter, the more or less pulpy sarcocarp providing food for pigs; micropyle and embryo basal.

Six or seven species in the West Indies, one of them also in southern Florida. None is known to be native in Panama but the trees are much planted and tend to be spontaneous, and Humboldt attributed his species (*regia*) to Panama but apparently *Oenocarpus panamanus* was mistaken for it. The Roystoneas are much planted in tropical countries around the world.

a. Pinnae on full-grown mature leaves in a single row or line either side the rachis, at least on the central or main parts of the leaf: fruit distinctly oblong and bean-like: crown of well-grown mature separate trees horizontal on the bottom or under side, very little if at all drooping so that the flower-clusters stand free against the sky.

1. R. OLERACEA

22. Pinnae noticeably in two rows either side the rachis and the leaf therefore with a tousled look: fruit globular or short-pyriform: crown with drooping base, covering the clusters.

2. *R. REGIA*

1. *ROYSTONEA OLERACEA* (Jacq.) Cook, in Bull. Torr. Bot. Club 28:554. 1901.
Areca oleracea Jacq. Select. Stirp. Amer. Hist. 1:278, t. 170. 1763.
Oreodoxa oleracea Mart. Hist. Nat. Palm. 3:166, t. 156, 163. 1837.
Gorgasia oleracea Cook, in Nat. Hort. Mag. 18:114. 1939.
Gorgasia maxima Cook, loc. cit. 1939.

To 40 m. and perhaps somewhat more in native forests, prominently bulged at base, usually more or less bulged also at the middle or above but in age becoming more uniform: leaves 3-7 m. long, 2 m. broad at middle, with 100 or more closely placed pinnae as much as 5 cm: broad, leaves with a flat look due to the simple arrangement of parts: spadix branches undulate or waved, at least when in cymba and after release: fruit oblong and usually somewhat curved, 15-20 mm. long, 9-10 mm. thick, purplish to black: note contrasts in key.

Farther West Indies islands, as on Trinidad, Tobago, Barbados, Martinique. A stately tree; known as the *Caribbee Royal Palm*.

2. *ROYSTONEA REGIA* (HBK.) Cook, in Science, loc. cit. 1900.
Oreodoxa regia HBK. Nov. Gen. et Spec. loc. cit. 1815.

Variable tree, usually not exceeding 25 m. in height, trunk not uniformly columnar but swollen at or near the middle and commonly at the base: leaves shorter and pinnae fewer in each line or row, with a brush-like look, pinnae 3-4 cm. broad: spadix branches not undulate: fruit long-globose to nearly globular, somewhat narrowed to base, 8-13 mm. long and approximately 10 mm. thick, red-brown or purplish at maturity.

Cuba; the *Cuba Royal Palm*, now most widely distributed of the species as a planted and spontaneous tree.

13. *WELFIA* Wendl.

WELFIA Wendl. in Gartenfl. 18:242. 1869.

Tall single-trunked monoecious pinnate-leaved unarmed palms bearing a dense high crown of ascending-spreading long leaves: spadices infrapetiolate, pendent, the thick heavy angled rachillae several from a very short peduncle, bearing flowers and fruits in deep pockets or cavities in several lengthwise rows; cymbas 2, ridged on back, soon deciduous: flowers large, whitish or ochroleucous, typically in 3's with pistillate in middle but usually more or less scattered, all sunken in pits provided with a pronounced lid or lip; staminate with narrow or lanceolate imbricate sepals and a cylindric corolla with obtuse valvate lobes, stamens many, the filaments united, pistillode minute or none; pistillate flowers about the size of the staminate, with imbricate free sepals and much larger imbricate petals two of which are boat-shaped and keeled, staminodia present in the form of teeth in the tube: fruit oblong or ellipsoid with basal stigma; seed with elongated lateral hilum, albumen equable.

Three species, Honduras to Colombia.

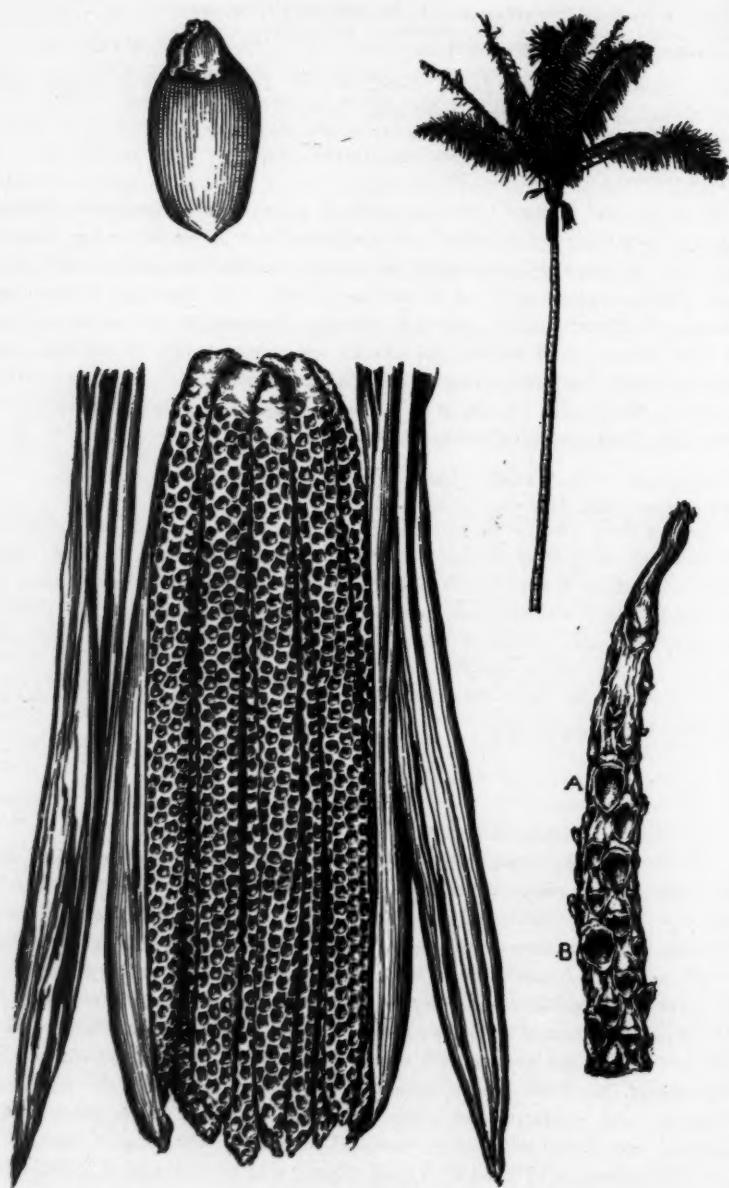


Fig. 59. *Welpa Georgii*. Alveoles at A and B.

1. *WELFIA* GEORGH Wendl. ex Burret, in Engler's Bot. Jahrb. 63:125. 1930.

Commanding tree 20 m. and more tall, trunk obscurely ringed with leaf-scars, 30 cm. diameter, without a crownshaft: leaves evenly both oppositely and alternately pinnate, glabrous but petiole and rachis more or less furfuraceous, blade 3-4 m. long or twice that length on large trees; petiole 1 m. long and, with the rachis, strongly ridged; pinnae often above 150, from 50 to 75 cm. long to 1 m. and more for the larger ones, and 3.5-5.5 and up to 11 cm. broad, narrowly pointed, reduplicate at base, strongly many-ribbed and midrib usually not clearly separable, splitting lengthwise in age into narrow strands and appearing therefore to be multiple: main cymba 60 cm. long, woody, many-ribbed and furrowed and splitting with age; spadices 1 or 2 at one time, peduncle flat and stout and about 10 cm. long from which several stout rachillae 30-40 cm. hang close to the trunk, the heavy rachillae octagonal and about 3 cm. thick with rows of flowers sunken deep in pits: fruit oblong-ellipsoid or almond-like, tapering in both directions, 3.5-4.5 cm. long and 17 mm. thick, glabrous; seed 1, albumen equable.

Panama, Costa Rica. First described from Sarapiquí River, northeastern Costa Rica; collected on Rio Hondo, Plains of Santa Clara, Costa Rica. Costa Rican and Panamanian trees need to be critically compared, as well as the insufficiently described *W. regia* of Colombia. Called *Palma Conga*.

CANAL ZONE: Quebrada Lopez, Allen 2112. COCLÉ: vicinity of La Mesa, El Valle de Antón, Allen 2565.

14. *EUTERPE* Gaertn.

EUTERPE Gaertn. Fruct. et Semin. Pl. 1:24. 1788.

Slender but mostly tall tree palms, monoecious, unarmed, trunk ringed, solitary or plant soboliferous, leaves pinnate, pinnae gradually narrowed and acuminate, sheaths of the petioles forming a conspicuous crownshaft, spadix infraxillary, in general somewhat like *Roystonea* in appearance but without the stout columnar trunk and the enormous hanging fruit-clusters of that palm, with a less pronounced crownshaft and a very different fruit: spadix with long slender drooping branches or rachillae that are not attached to rachis by a suddenly expanded base; spathes 2, cymba-like: flowers staminate and pistillate in the same spadix, typically in 3's with the middle one pistillate but usually irregular in this respect and the upper end of the rachilla mostly staminate, free or only partially immersed in the axis; sepals very small, pistillate petals valvate; stamens 6: fruit small, globose, 1-celled, drupe-like, with more or less succulent exterior but soon drying hard into a fibrous covering of the nutlet or seed, not immersed in the rachis, stigma lateral or at least not apical, embryo mostly lateral but sometimes super-lateral or basal; albumen either plane or ruminant.

About 50 species in the West Indies and from Nicaragua to South America, only one species (*E. panamensis*) having been reported heretofore from Panama.

For our purpose we may divide the genus into two sections: *Euterpotypus* Burret (*Euterpe* proper) in which the fruits have ruminant or much-divided albumen from intrusions of the walls; *Euteropsis* Burret, with plane or non-ruminant (clear solid white) albumen.

- a. Albumen of the seed conspicuously ruminant: pinnae tending markedly to split as if dividing into 2 or more: rachillae colored, glabrous, very slender, about 1-2 mm. thick when dry _____ 1. *E. ROSEOSPADIX*
 aa. Albumen plane (white and not divided): pinnae with little tendency to split: rachillae white, pubescent, 4-5 mm. thick _____ 2. *E. PANAMENSIS*

1. *EUTERPE ROSEOSPADIX* Bailey, Gent. Herb. 6:201. 1943.

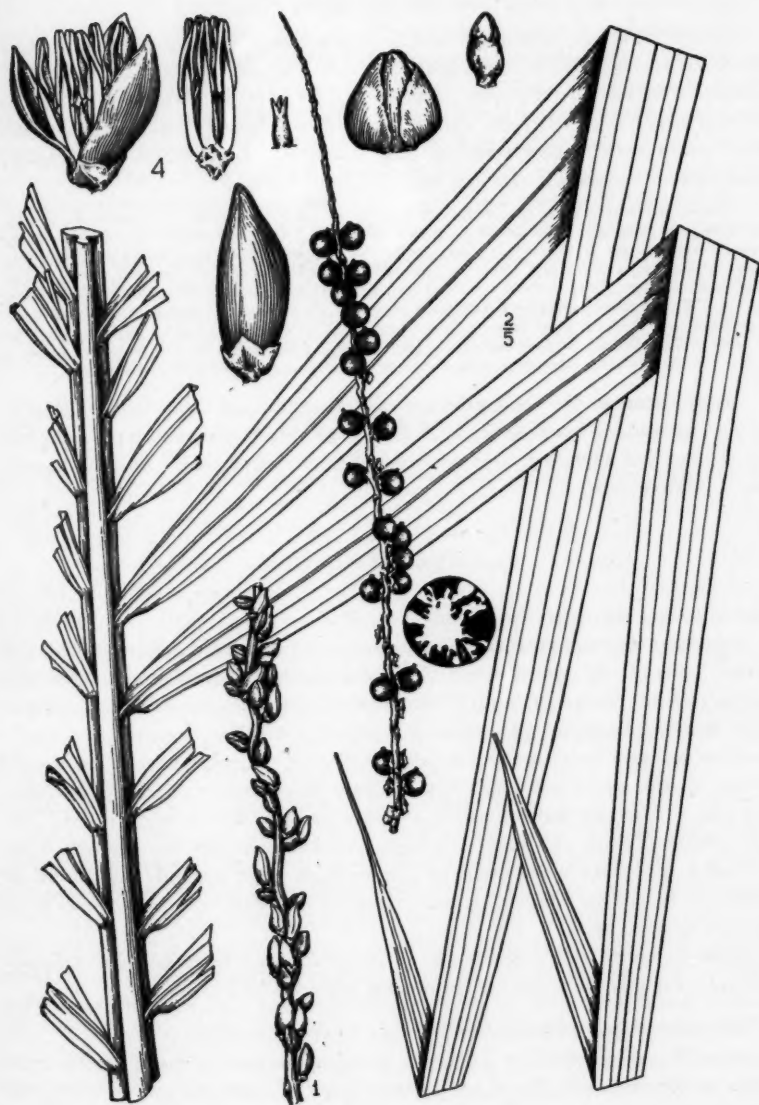
Erect, to 2 m.: leaves pinnate, glabrous unless for minute puberulence under a lens on bottom side; leaf-blade 1.5 m. or more long, 1 m. broad at middle, pinnae opposite and alternate at different parts of the rachis, the rachis triangular in section and ridged; pinnae 25 or more on either side of rachis, long-linear, the main ones 50 cm. long and 4-5 cm. broad at middle, tapering to narrow points but not caudate, splitting at the base as if two or three of them were attached together, midrib prominent and on the under surface more or less lepidote, side-veins less pronounced and few; petiole 1 m. long, somewhat flecked or lepidote but perhaps becoming glabrous, concave on upper face, ridged on lower face: spadix bright pink, glabrous or becoming so; rachillae 30-40 cm. long, very slender and only 1-2 mm. thick when dry, branched, angled in drying, rather closely flowered; staminate buds at anthesis 5-6 mm. long, 2-3 mm. thick, prominently pointed; pistillate buds 2-3 mm. long, not pointed: fruit nearly globular but oblique, 9-10 mm. thick either way when dry, stigmatic point pronounced but not central, cupule applanate and conspicuous; seed with tessellate exterior, solid and white in center, ruminant one-half or more the diameter with coarse projections from the walls.

Panama; known as *Manaca*.

CHIRIQUI: vicinity of Bajo Chorro, alt. 1900 m., Woodson & Schery 623.

2. *EUTERPE PANAMENSIS* Burret, in Notizbl. Bot. Gart. u. Mus. Berlin 11:864. 1933.

Caudex about 4-5 cm. diameter: leaves regularly pinnate, the pinnae opposite, spreading, linear, 30-40 cm. long, about 3 cm. broad, very narrowly acuminate and the acumen filiform; midrib and usually the large nerves on under surface provided with brownish scales, the lower face strongly covered with numerous very minute cinnamon-colored scales and minutely puberulent; leaf-sheath 75 cm. long, costate, brownish-scaly but becoming glabrous; petiole 12 cm. long above the sheath, rounded on back, furrowed on upper face, about 13 mm. thick at apex; rachis brownish-scaly or ferrugineous: spadix small, white-tomentose, the hairs very minute and dense; peduncle 7-8 cm. long, clasping at base; rachis about 16-17 cm. long; rachillae about 30, drooping, about 50 cm. long, densely provided with spirally arranged foveae or depressions in which flowers and fruits are placed, white in color and very finely closely pubescent, in the main part 3-5 mm. thick when dry: mature fruit not described.

Fig. 60. *Euterpe roscospadix*

Panama. Assigned by Burret to the section *Euteropsis*. Called *Raviorca*.
CANAL ZONE: Aqua Salud, Cook & Martin 59.

Probably *Euterpe panamensis* is a widespread and variable palm in Panama. The material available for the original diagnosis was not sufficient for full definition and fruit was not available. Two collections by P. H. Allen, 2534, 2940, in the region north of El Valle, Coclé, probably belong here although apparently larger palms than *E. panamensis* as first described. Allen makes the following comments on variation in size and habit:

"This is seemingly by far the commonest *Euterpe* of the Valle region. The plants are variable, depending on conditions under which they have developed. Poor soil and steep rocky windswept slopes develop slender comparatively dwarf invariably single-stemmed trees, often less than three inches in diameter, and fruiting when not more than twenty feet tall. In favorable situations they occasionally produce three or four trunks from a common base, which seems to be rather the exception. Well-developed specimens have gray obscurely ringed trunks, averaging about six inches in diameter, and fruiting when fifty or sixty feet tall. The basal portion of the trunk is supported by more or less stilt-like lacquer-red roots, these forming a buttressed mound averaging a foot in height. In all specimens, the albumen is consistently plane, and the embryo directly basal."

Mature fruits of the Coclé palm are variable in size and shape, shortly globular-oblong and more or less oblique, 8-10 mm. thick, black, glabrous, style persistent, cupule large and applanate; seed ornamented with rapheal veins, albumen homogeneous, embryo basal.

15. OENOCARPUS Mart.

OENOCARPUS Mart. Hist. Nat. Palm. 2:21. 1823.

Arboreous unarmed pinnate-leaved monoecious palms with solitary or clustered trunks, some of the species south of Panama having the foliage arranged distichously in the crown or head: inflorescence infraxillary, borne below a crownshaft; flowers unisexual, not immersed, normally a pistillate between two staminates but on most rachillae the pistillates missing on the apical part of the strand; stamens 6, the sepals and petals both valvate or perhaps indistinctly somewhat imbricate at base, pistillodium usually evident; pistillate flowers much shorter than the staminates, sepals and petals imbricate, staminodia usually not evident: fruit a 1-seeded drupe-like small ovoid or globose body with more or less fibrous or sometimes succulent exterior, stigma terminal or nearly so; seed with plane albumen, embryo basal.

South American palms, one species in Panama; about 16 species, not well understood. Perhaps the genus will be divided when better known.

1. OENOCARPUS PANAMANUS Bailey, Gent. Herb. 3:71. 1933.

Graceful and slender but tall palm growing in small clumps usually with trunks of different ages, 25 m. and perhaps more tall, with a "smooth" look, the boles bamboo-like and ringed but not indented or notched, to 15 cm. thick; crownshaft blackish-green: leaves long-pinnate, glabrous, 2 m. and more, spreading and downwardly curved; pinnae alternate, about 60 either side the concavo-convex

rachis, 50–80 cm. long, 4 cm. or less broad, long-pointed, unequally bifid at apex, 2–3 ribs either side the midrib; petiole to 1 m. long, slender, terete except with deep narrow groove on upper side: spadix with short peduncle or handle, 15–25 cm. long, from which depend many scurfy-pubescent rachillae 40–75 cm. long, closely flowered except the tip which is naked for 2–5 cm.; spathe double, outer part of 2 woody valves 20–25 cm. long, inner or persistent part a tomentose tube or sleeve 30–40 cm. long that splits on one side; staminate flowers 3–5 mm. long in full bud, stamens 6 with short filaments and versatile anthers: fruit near base of rachillae that make prominent hanging cluster, black with hard exterior, short-ovoid to obscurely obovoid, 2–2.5 cm. long, with very short abrupt point; nutlet tightly inclosed in fibers, nearly globular, albumen white, center cavitous.

Panama. Called *Maquenque*.

CANAL ZONE: in woods, Barro Colorado Island, *Bailey 75* (TYPE). The tree may be mistaken for a *Roystonia*, and such confusion apparently led to the early assignment of *R. (Oreodoxa) regia* to Panama.

16. PRESTOEA Hook. f.

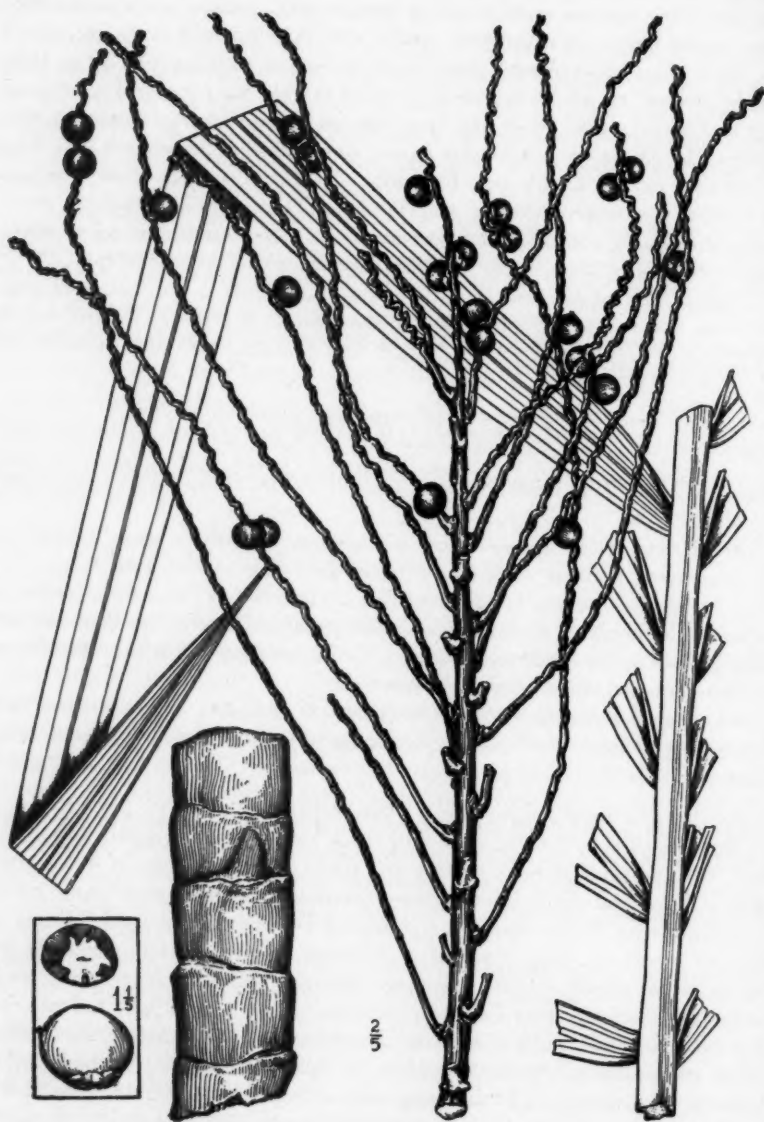
PRESTOEA Hook. f. in Benth. & Hook. Gen. Pl. 3:899. 1883; Bailey, Gent. Herb. 4:382. 1940.

Small trees of the *Euterpe* kind but without crownshaft above spadices or flower-clusters, pistillate spadices with short ascending or divaricate rather than long slender and drooping rachillae and that are attached to rachis by a swollen or bulboid base, petals of pistillate flowers convolute-imbricate rather than valvate: fruit gibbous or lop-sided; seed lacking a fibrous covering and with a marbled or tessellate exterior; albumen strongly ruminate.

Three species distinguished in the farther West Indies, one in Panama, one known only in cultivation some fifty years ago in England said to have come from Guatemala.

1. PRESTOEA SEJUNCTA Bailey, Gent. Herb. 6:201. 1943.

Erect small tree, 5 m. or more tall; trunk about 5 cm. diameter, woody and hard, with pronounced rings about 3 cm. apart, bearing a crown of 4–8 mature pinnate leaves and devoid of a regular crownshaft: blade of main leaves nearly 2 m. long, with 70–80 subopposite pinnae on a triangular red rachis; pinnae at mid-leaf 60–65 cm. long, 3.5–4 or 5 cm. broad, glabrous, margins more or less thickened or ribbed, midrib prominent, side-ribs markedly subordinate, long-acuminate, the lower ones essentially caudate; petiole with a split and clasping base 6–7 cm. across, nearly 1 m. long, concavo-convex in section: spadices infralobar, erect, close to the coma or crown of leaves, about 4 in number; spathe-valves 2, the outer about 20 cm. long, inner or main one 75–80 cm. long, 2–2.5 cm. broad before dehiscence, bearing reddish-brown furfur; peduncle of spadix red, terete but perhaps angled in drying, 25–30 cm. long, passing into a continuing rachis 30 and more cm. long; rachillae about 25, pinkish, strongly ascend-

Fig. 61. *Prestoea sejuncta*

ing, 30–70 cm. long, glabrous, much swollen at base just as they join the rachis; flowers in shallow depressions on the rachillae: fruit depressed-globose, black, 10 mm. high and 11–12 mm. thick, lop-sided and stigmatic point off-center, cupule of more than 6 parts and applied tightly to the surface; seed irregularly depressed-globular, loose inside a thin inner mesh, about 8 mm. across the long way, surface tessellate, basal scar very broad; albumen ruminant, being filled with brown partitions that extend to the cavitous center.

Panama. This makes five recognized species of the neglected genus *Prestoea*, which lacks the crownshaft of *Euterpe* and differs in floral and fruiting characters.

CANAL ZONE: vicinity of Police Station, upper Rio Pequini, Madden Lake area, *Fairchild & Jobbins 2635*. COCLÉ: El Valle de Antón, about 1000 m., vicinity of La Mesa, *Allen 2740*.

17. WOODSONIA Bailey

WOODSONIA Bailey, *Gent. Herb.* 6:262. 1943.

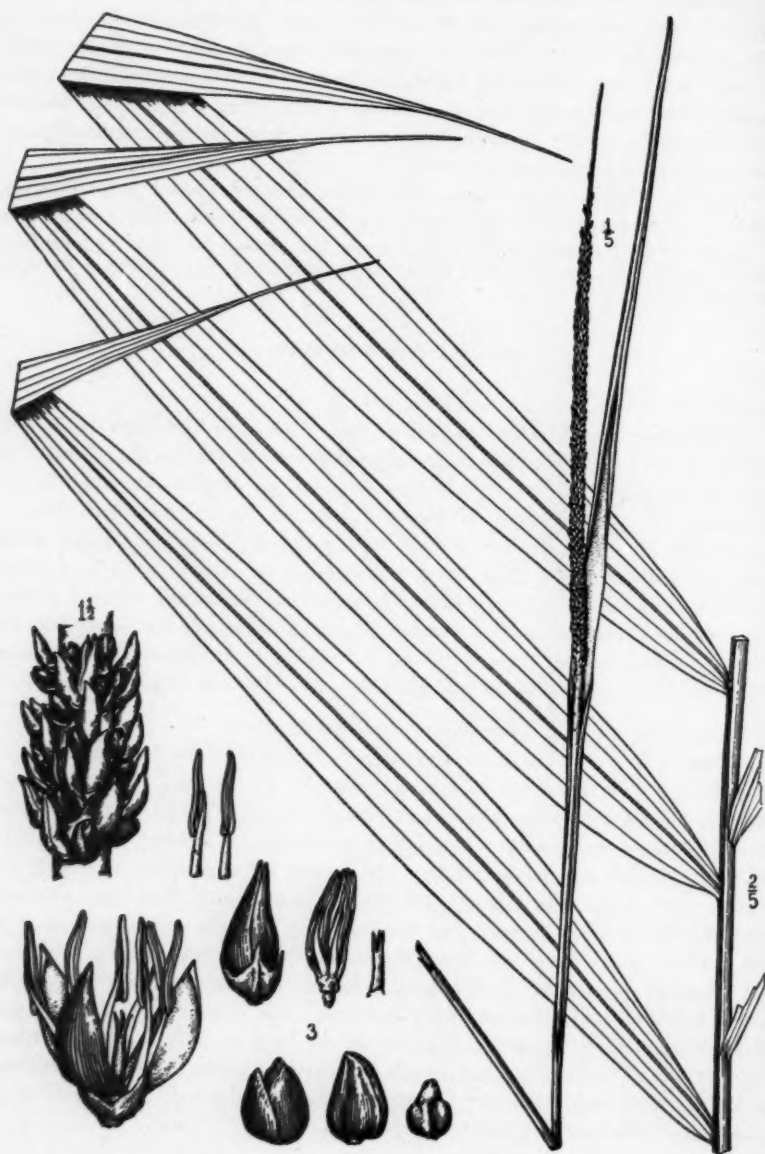
Geonomoid pinnate-leaved monoecious palm with chaff-like flowers in a long narrow simple spadix like that of the grass *Ammophila*, the pistillate beneath or more or less between 2 pointed striate staminate, all of them only lightly immersed on the rachis; staminate flowers 6–7 mm. long in full bud, with short 3-pointed calyx cupulate at base, 3 long narrow pointed slightly imbricate petals free and hardly united at base somewhat exceeded in anthesis by 6 long linear versatile conjoined anthers on separate filaments only moderately widened toward base, pistillode columnar with 3 pointed stigmas; pistillate flowers much shorter, envelopes imbricate and about equal in both series, ovary about 1.5 mm. long, somewhat oblate and narrowed into a conical part; albumen apparently ruminant.

1. WOODSONIA SCHERYI Bailey, *Gent. Herb.* 6:262. 1943.

Erect, 2–3 m. tall: leaf-blade 1 m. or more long and 75 cm. broad with 14–20 long-linear pinnae either side of rachis; pinnae 35–45 cm. long, 3–5 cm. broad, tapering to long thin point, glabrous or perhaps minutely puberulent underneath, somewhat glossy, subopposite and alternate and sometimes missing, attached 5–10 cm. apart, midrib not very prominent and several side-ribs nearly as strong and 5 mm. more or less apart; petiole 60–70 cm. long, expanded at base, narrowly grooved on upper face at lower end but becoming strongly angular and more or less 4-sided: spadix 30–45 cm. long, 10–14 cm. thick, tapering to top, terminating a slender peduncle of equal or greater length, the main spathe a single tight sheath produced into a narrow blade that equals the inflorescence; flowers compactly placed, white, becoming stramineous, the buds at anthesis having an upright or ascending direction and loosely imbricating; staminate buds at anthesis period 6–7 mm. long when dry, curved, prominently pointed; pistillate buds at same period 3–4 mm. long and hardly pointed.

Panama.

CHIRIQUÍ: vicinity of San Bartolomé, Peninsula de Burica, alt. 0–50 m., *Woodson & Schery 894*.

Fig. 62. *Woodsonia Scheryi*

(280)

18. NEONICHOLSONIA Dammer

NEONICHOLSONIA Dammer, in Gard. Chron. ser. 3, 30:178-9. 1901. Fig. 56A mistakenly legended "*Asterogyne Martii*."

Bisnicholsonia O. Ktze. in Post & Ktze. Lex. Inserenda and p. 621. 1904.

Geonomoid pinnate-leaved acaulescent monoecious palms with very long and slender simple spadix continuing the long peduncle, distinguished technically by the long stamens united only at base, anthers somewhat sagittate, the two cells joined by a thin connective or intermediate tissue that extends between and beyond the apex of the anthers into a mucro, pistillode short with 3 styles united at base; flowers lightly immersed on the rachis.

Two species in Costa Rica, one of them reported also in Panama; little known. Described originally from cultivation under glass in Europe, fruits not reported.

1. NEONICHOLSONIA GEORGEI Dammer, loc. cit. 1901.

Leaves pinnate, glabrous, to 2 m. long; pinnae alternate or the lower ones opposite, 10-11 on either side of rachis, lanceolate and long-acuminate, 30-36 cm. long and 8 mm.-5 cm. broad, placed 5-10 cm. apart, terminal pair confluent at base, midrib pronounced, main lateral nerves 2 on either side; petiole quadrangulate and about 48 cm. long and vaginate for 20 cm.; rachis about 70 cm. long; spadix without peduncle 55 cm. long and 5 mm. thick when dry, the slender peduncle of similar length; alveoles partially raised above the surface of the glabrous axis of the spadix and rimmed like a saucer with the short floral envelopes remaining after flowering stramineous and striate and as broad as long; immature fruit conic, truncate at apex.

Panama.

CHIRIQUÍ: Cerro de la Plata, near San Felix, eastern Chiriquí, in forests, alt. 120-150 m., Pittier 5167.

19. SYNECHANTHUS Wendl.

SYNECHANTHUS Wendl. in Bot. Zeit. 16:145. 1858.

Slender small and usually inconspicuous unarmed glabrous monoecious shade-loving palms with infrafoliar inflorescences: leaves irregularly pinnate or pin-natisect: peduncle as long as the flowering part of the spadix, erect, arising from a sheath and itself covered in close-fitting sheaths that soon become dry and perhaps shreddy: flowers minute in lines or little acervuli on very slender ascending rachillae, several together, of which the basal one is pistillate and the others staminate, not sunken in the axis; petals valvate in the bud in the staminate flower and convolute-imbricate in the pistillate, more or less connate at base; stamens 6: fruit oblong, small, slightly succulent; albumen white, intruded by projections from the walls.

Three species, Guatemala, Costa Rica, Panama.

1. *SYNECHANTHUS WARSCEWICZIANUS* Wendl. loc. cit. 1858.

Tree to 5 m. tall, with single green ringed arundinaceous trunk 2-3 cm. thick, sometimes with brace-roots at the base: leaves irregularly pinnate, glabrous, the blades 1 m. and more long and bearing 8-10 subopposite drooping pinnae or segments either side the very slender angled rachis; pinnae or parts from 1 to 12 cm. broad and 30-50 cm. long, lanceolate and long-pointed, lacking midrib but provided with several or many strong parallel nerves 5-10 mm. apart; petiole 50-75 cm. long, slender, smooth, grooved on upper face, sheathing at base: spadix a broom-like structure with 20 or more very slender ascending or divaricate rachillae arising from a continuing and terminating an erect completely sheathed peduncle; flowers very small and often overlooked, flat-topped, 4-9 of them in alternating acervuli, of which the basal one is pistillate: fruit oblong, 15 mm. long, lemon-yellow to light orange but drying black, sparse on the rachillae inasmuch as the pistillate flowers are single in each of the scattered acervuli; albumen invaded by lateral dark-colored projections.

Panama. Originally described from Costa Rica.

CANAL ZONE: Barro Colorado Island, *Bailey 523*; Quebrada Ancha, *Dodge & Steyermark 17047*; Quebrada Lopez, *Allen 2133*.

20. *HYOSPATHE* Mart.

HYOSPATHE Mart. Hist. Nat. Palm. 2:1. 1823.

Arundinaceous small erect spineless glabrous pinnate-leaved or pinnatisect monoecious palms with infrapinnate inflorescences: flowers small, in branched spadices, on long slender rachillae, normally 1 pistillate between 2 slender staminate but placement often irregular; spathes long and slender, at base of spadix and at first inclosing it; staminate flowers with 3 long narrow valvate petals and 3 small connate sepals, stamens 6; pistillate flowers much smaller, sepals and petals imbricate, pistil 3-loculed, staminodia present: fruit a small ellipsoid drupe-like body, 1-seeded, scarcely fleshy, about 1 cm. long; embryo basilar.

About a dozen South American species, one of them in Panama. *Hyospathe pubigera* of Trinidad is *Prestoea pubigera* Nichols.

1. *HYOSPATHE LEHMANNII* Burret, in Notizbl. Bot. Gart. u. Mus. Berlin 11:859. 1933.

Trunks few or many, sometimes as many as 25, cane-like, 2.5-5 cm. thick, 2.5-3.5 m. tall, nodal rings well marked: petiole with long clasping basal sheath; leaves with free part of petiole 50-60 cm. long, irregularly pinnate; main pinnae, as at bottom and top, 4-7 cm. broad and strongly many-ribbed, intermediates 1-4 cm. broad, long narrow-pointed, 25-35 cm. long; spathes 2, inner or main one 30-35 cm. long, outer one somewhat shorter, narrow, smooth and glabrous; spadix divaricate, peduncled, rachillae 12-30, slender, 20-30 cm. long, profusely flowered: flowers purple or reddish in bud; staminate 4-5 mm. long and about

1 mm. thick, pointed: fruit not described.

Panama. Species founded on collections near Buenaventura, Colombia, by F. C. Lehmann.

COCLÉ: vicinity of El Valle de Antón, Allen 2066.

21. GEONOMA Willd.

GEONOMA Willd. in Mém. Acad. Sci. Berlin 1804:37.

Small unarmed monoecious palms, either bushes or low trees, trunks ringed and often arundinaceous: leaves pinnate, pinnatisect or at least pinnately veined: spadices interfoliar or infrafoliar, either a simple spike or somewhat branched; spathe not cymba-like: flowers partially or deeply immersed in the rachilla or rachis, morphologically 1 pistillate between 2 staminate but this disposition not always the pattern, in which case the upper part of the rachilla may be almost or quite uniformly staminate; floral envelopes 6 in two series, calyx and corolla, the parts or lobes usually imbricate in the bud except that the corolla parts of the staminate flowers are commonly valvate; stamens 6, as also the staminodes in the pistillate flower, the filaments in both cases united into a dentate or lobed tube that, in connection with the separated spreading anther-cells, constitutes the particular mark of the genus; ovary sitting in a free disk or cushion, 3-loculed, style lateral or near base, stigmas 3, 1 or 2 locules abortive: fruit a very small drupe-like 1-seeded globular or ovoid or somewhat pyriform body, the mesocarp more or less fleshy and only seldom edible; seed with basal hilum, albumen equable.

Well toward 200 species from Mexico and Hispaniola to Peru, Bolivia and Brazil; many species in the Amazon region, more than 60 in Colombia. Woods palms of minor size. The genus was founded on two species of Venezuela.

Genus *Calyptrogyne* may be represented in Panama but materials are not yet sufficient to work out the case. It differs from *Geonoma* in the sagittate basifixed anthers, the anther-cells not discrete or separated on minute pedicels, style central rather than lateral or sub-basal, fruit 3-loculed, often obovoid. *Calyptrogyne* is a small group native in Mexico, Central America, parts of South America. They are arundinaceous small palms; arboreous plants of the Antilles sometimes referred to the genus are properly *Calyptronoma*. Perhaps some of the species described in *Geonoma* may be determined as *Calyptrogyne* when flowers and mature fruits are better known.

- a. Spadix or flower-cluster simple, on a long slender peduncle ascending from a lower axil or near the ground, unbranched, comprised of either 1 straight thin spike or of a few straight spikes standing finger-like at top of peduncle, the cluster lacking an elongated rachis or axis; spathe of 1 or 2 narrow sheaths on peduncle.
- b. Spike 1 on the peduncle, strictly terminal.
- c. Leaf-blade habitually entire (of one piece) although bilobed at apex or sometimes its base somewhat and irregularly split or pinnatisect into more or less separate parts: trunk very short, or little noticeable above the ground.
- d. Terminal lobes of leaf straight. _____ 1. G. DECURRENS

- dd. Terminal lobes curved toward the top or falcate..... 2. *G. OBOVATA*
- cc. Leaf-blade habitually pinnate, with distinct separate pair or pairs of pinnae (*G. obovata* is not to be sought here): trunk usually evident.
 - d. Pinnae long (40–50 cm.), straight to apex, not tailed, often very narrow, strongly costate, gray-green: fruit large, 15 mm. or more long..... 3. *G. COSTATIFRONS*
 - dd. Pinnae otherwise: fruit 12 mm. or less long.
 - e. Apex of pinna a very slender cauda or tail, and abruptly narrowed; pinnae short (25 cm. or less)..... 4. *G. ALLENI*
 - ee. Apex of pinna curved or falcate, not caudate; pinnae 30 cm. or more long.
 - f. Pairs of pinnae 1 or 2, with rachis below the terminal part vacant for 10 or 12 cm..... 5. *G. CONDENSATA*
 - ff. Pairs of pinnae several or many and close together..... 6. *G. PROCUMBENS*
 - bb. Spikes few or several attached at apex of slender peduncle and radiating or spreading therefrom, the axis of the cluster very short or none..... 7. *G. SIMPLICIFRONS*
 - aa. Spadix compound, with branches extending from a central rachis, the peduncle short and spreading from the trunk in an upper axil; spathe cymba-like at base of stout peduncle.
 - b. Rachillae short, 10 cm. or less long, simple or once-forked.
 - c. Pinnae few, these and the terminal lobes 8–12 cm. broad, the tips caudate..... 8. *G. CONGESTA*
 - cc. Pinnae many pairs, 5 cm. or less broad, the tips acute or acuminate..... 9. *G. FERRUGINEA*
 - bb. Rachillae slender, 20–30 cm. long, drooping in a much-branched very compound cluster: leaf-blade divaricately pinnate..... 10. *G. BINERVIA*

1. *GEONOMA DECURRENS* Wendl. ex Burret, in Engler's Bot. Jahrb. 63:162. 1930.



Fig. 63
Geonoma decurrens
A, alveole or pit left by the fallen fruit.



Fig. 64
Geonoma procumbens

Erect, trunk to 2 m. tall and 4 cm. thick but sometimes little noticeable above the ground: leaves 8–10 at top of trunk, 1 to nearly 2 m. long, 20–30 cm. broad toward apex and narrowing to base, thin in texture, pinnately veined and simple but deeply 2-lobed at apex, all apices straight, sometimes irregularly split on one side or the other into what look like narrow separate pinnae, the blade decurrent on petiole, glabrous or perhaps somewhat furfuraceous on petiole, rachis and often on the numerous very strong veins: spadix a simple slender spike 30–40 cm. long, drooping on a slender flattened long peduncle which is sheathed by spathe at base, spike commonly unisexual, all the flowers sunken in the axis; staminate flowers whitish, conspicuously projecting at anthesis, filaments united in a tube, anthers separated by an orange connective; pistillate flowers purplish, usually exserted, staminodes

represented in a tube, stigmas 3 and pronounced: fruit ovoid or broad-ellipsoid, 7–8 mm. long and 5–6 mm. the flatter way, glabrous, light greenish-yellow.

Panama, deep woods, probably widespread. Costa Rica.

CANAL ZONE: Barro Colorado Island, *Bailey 125; Standley 40896; Quebrada Ancha, Steyermark & Allen; Quebrada Bonita, Dodge & Allen 17126.* COCLÉ: vicinity of El Valle de Antón, *Alston & Allen 1838; Woodson & Schery 173.* BOCAS DEL TORO: Isla de Colón, *Woodson, Allen, Seibert 1946; von Wedel 488.*

2. *GEONOMA OBOVATA* Wendl. ex Spruce, in Jour. Linn. Soc. Bot. 11:104. 1871.

Small plant, trunk 50 cm. high and 15–20 mm. thick: leaves long-petioled, the blade simple or somewhat pinnatisect, ambitus or outline obovate-cuneate, deeply bilobed at apex, 1 m. or somewhat more long and 20–25 cm. broad, with 20–30 strong nerves either side the rachis or some of the few divisions (when the blade is split) with about 7 nerves, apices sharply acuminate and curved or falcate, somewhat brown-hairy underneath at least when young: spadix arising from between the lower leaves, the flowering simple spike 10–20 cm. long, dense, narrow spathe-sheaths conspicuous on the lower part or to middle of the slender erect peduncle: fruit not described.

Panama, Costa Rica.

PANAMÁ: Mt. Pirri, *Goldman 1970* (det. Burret).

3. *GEONOMA COSTATIFRONS* Bailey, Gent. Herb. 6:206. 1943.

Slender, 3–4 m. tall, glabrous unless scurfy on petioles: leaves unequally pinnate; blade about 1 m. long; petiole 75 cm.–1 m. long, firmly clasping for perhaps one-third its length, very slender, flattish on under side and 5–10 mm. across, sharply ridged on upper surface; pinnae 40–50 cm. long and 3–8 cm. broad with middle 3–4 cm., long-tapering rather abruptly into a narrow end and usually (as narrower ones intervening or near the apex, alternate and opposite, about 2 or 3 main pairs aside from a terminal broad pair and sometimes terminal very narrow shred-like units, all of them with broad base from which extend several or many costae or ribs prominent on both surfaces and yellowish underneath and between which the pinna tends to split lengthwise, all very gradually and straightly tapered to long narrow point, placement of the pinnae often far apart on the rachis sometimes as much as 12 cm., so that the leaf may have an open or skeletonized look: spadix a simple spike to 30 cm. or more long on an angled glabrous peduncle two to three times as long and subtended at the base by a very long narrow leaf-like spathe; axis of spadix glabrous, the pits distinctly separated and its lower lip retrorse and striate after anthesis: fruit (yet immature although apparently about full size) oblong-pyriform, 15–16 mm. long, 10 mm. broad toward apex which is obtuse, glabrous, drying roughish.

Panama.

rachis and not always precisely opposite, length about 20–25 cm., breadth at

CANAL ZONE: Upper Río Pequini, Madden Lake area, vicinity of Police Station, *Fairchild & Jobbins 2639; Quebrada Lopez, Allen 2134.*

4. *GEONOMA ALLENII* Bailey, Gent. Herb. 6:204. 1943.

Very slender small palm to 2 m. tall: leaves pinnate, practically evenly gray-green, with blade 25–35 cm. long and concavo-convex petiole of similar length; pinnae 2 pairs and a terminal deeply bifid part, the bases broad at attachment to

rachis and not always precisely opposite, length about 20–25 cm., breadth at middle 3–4 cm., long-tapering rather abruptly into a narrow end and usually (as on apical lobes) into a thread-like cauda 5–7 cm. long, veins pronounced and about 4–5 mm. apart and elevated on upper face, glabrous on both surfaces: spadix a simple slender glabrous spike 10–14 cm. long subtended by a sessile bract (upper spathe-valve) that leaves a ring when it falls, the very slender erect peduncle about 50 cm. long with glabrous striate sheathing spathe-valve at base; rachilla or spike 2–3 mm. thick at fruiting time, alveoles distinct and separate in about 4 rows, the narrow nearly or quite entire lower lip divaricate and prominent: fruit oblong-pyriform, 10–11 mm. long, somewhat narrowed to base, nearly obtuse at apex, glabrous, somewhat pimples.

Panama.

COCLE: hills north of El Valle de Antón, alt. 800 m., Allen 2947.

5. *GEONOMA CONDENSATA* Bailey, Gent. Herb. 6:206. 1943.

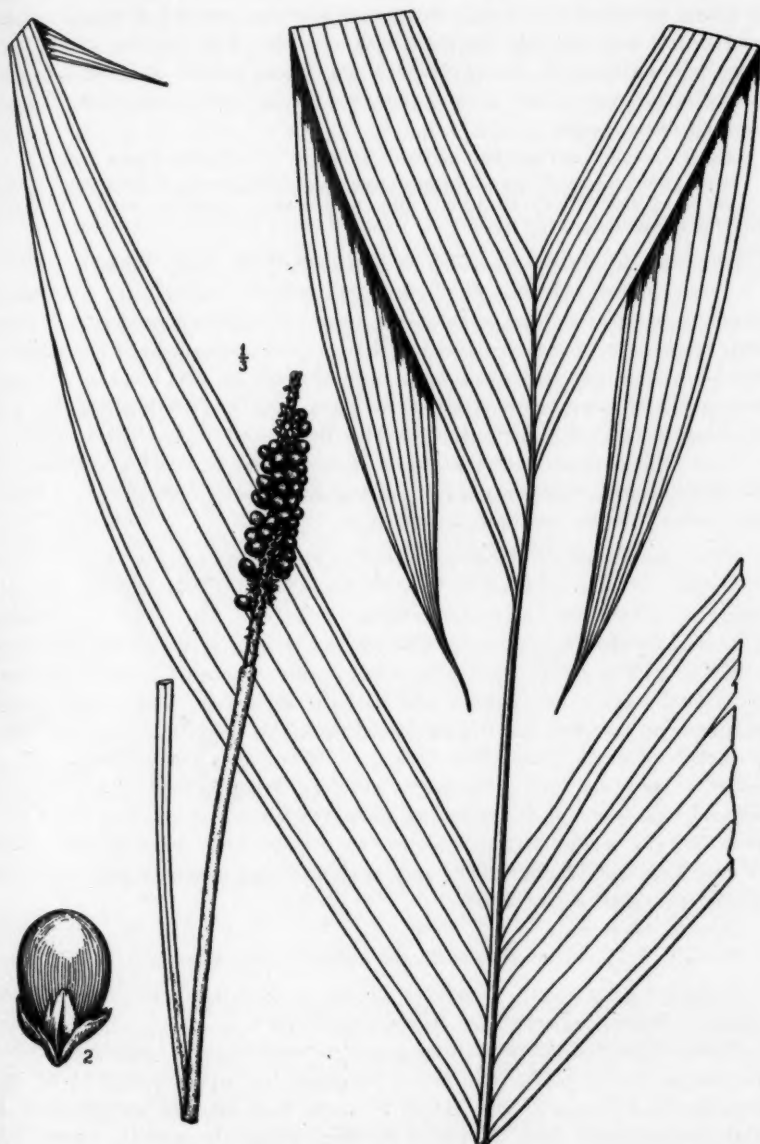
Tree or bush 1.6 m. tall: leaf-blade about 1 m. long, dull green, irregularly pinnate, glabrous both surfaces, lighter-colored underneath; pinnae about 2 pairs including the bilobed apical part, and a few intermediaries or shreds (as splits of pinnae) between, the separation between the two pairs being perhaps 10–12 cm. of rachis, the wide bases irregularly opposite; terminal part divided into long-acuminate lobes 40–50 cm. long and 4–6 cm. broad; each of the other pair 40–50 cm. long and 6–7 cm. broad; all pinnae and lobes very strongly many-ribbed, the main ribs whitish on under surface and 10–12 mm. apart with 2 or 3 thinner nerves between; petiole and rachis slender, glabrous, sharply ridged on upper surface: spadix a single simple spike 12–16 cm. long, borne on a flattened two-edged petiole-like peduncle 1 m. long; rachilla glabrous but granular, about 4 mm. thick; alveoles close together, broad rather than high before frutescence, the lips not prominently projecting: fruit oblong, 11–12 mm. long, only slightly contracted to base, obtuse at apex, glabrous, carrying the 6 enlarged nearly separate narrow floral envelopes with it when removed and leaving a chaffy cup of 3 projecting bracts.

Panama.

BOCAS DEL TORO: Isla Colón, vicinity of Chiriquí Lagoon, von Wedel 2972.

6. *GEONOMA PROCUMBENS* Wendl. ex Spruce, in Jour. Linn. Soc. Bot. 11:105. 1871.

Ordinarily seen as an acaulescent palm, the caudex rising little if at all above the ground, but sometimes making a leaning or inclined ringed trunk 2 m. tall and 7–8 cm. thick: leaves from apex of caudex, pinnate, glabrous, blade 1 m. or more long; petiole slender, smooth, often 1 m. long; pinnae about 24 pairs, mostly narrow but differing in width on the same leaf from 2 to 5 cm. except the terminal pair which may be 10 cm. or more broad, 40–50 cm. long, strongly nerved, base somewhat decurrent on the rachis, apex long-acuminate and prominently falcate: spadix a simple spike on a long slender erect peduncle from a lower axil, spathes bract-like on the peduncle, flowering part of the spike about 50 cm. long and

Fig. 65. *Gronoma condensata*

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12–15 mm. thick, the flowers sunken in the rachilla in a closely packed sequence; staminate flowers whitish, soon perishing, the 6 anthers exserted, filaments connate in a tube; 3 white stigmas also exserted at anthesis: fruit at maturity 9–10–11 mm. long and about one-half as broad, ovoid-elliptic, pointed at either end, gray as if glaucous, very faintly striate, greenish on a dull red rachis; nutlet about 8 mm., albumen equable.

Panama, woods and gulches, probably generally distributed; Costa Rica.

CANAL ZONE: Barro Colorado Island; Quebrada Ancha, *Dodge & Steyermark 17065*, COCLÉ: north rim, El Valle de Antón, *Allen 1790, 2065*. BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 2214*.

7. *GEONOMA SIMPLICIFRONS* Willd. in *Mém. Acad. Sci. Berlin* 1804:37.

Trunks several, 2–4 m. tall, flexuose, pale yellow or olive-gray, prominently ringed: mature leaves 1 m. or more long, oblong-lanceolate in outline, dull green with whitish nerves, deeply parted into 2 or 3 pairs of broad-based lanceolate or broad-lanceolate narrow-pointed lobes: peduncle 15–20 cm. long, at the apex bearing 3–6 or more terete sharp-pointed short erect or ascending rachillae 3–8 cm. long: fruit small, cherry-like, somewhat fleshy, acute at apex, dark violet.

In woods, southern Darién, *Seemann*, apparently not reported subsequently; a Venezuelan-Brazilian species, not listed among the palms of Colombia; it is doubtful whether it occurs in Republic of Panama.

8. *GEONOMA CONGESTA* Wendl. ex Spruce in *Jour. Linn. Soc. Bot.* 11:112. 1871.

Trunks or canes cespitose, 4–5 m. tall and 25 mm. thick, remotely annulate with rings 10–20 cm. apart: leaves about 2 m. long, dark green and shining, blade elongate-obovate, cuneate at base and deeply bifid at apex with very long-acuminate or thin caudate lobes sometimes irregularly pinnatisect with a few narrow lateral lobes close together, stiff or rigid in texture, with 50–60 strong lengthwise nerves either side and no definite midrib to the 2 broad terminal lobes: spadices short, issuing from ribbed cymbas 10–20 cm. long, that are short-acute or almost obtuse at the apex, peduncle 6–9 cm. long, branches 7–11, at first hanging but soon wide-spreading and sprawling, each branch about 10 cm. long and 6 mm. thick with the pointed divergent bracts conspicuous: fruit broad-ellipsoid, about 15 mm. long and 12 mm. thick, gray, surface drying rough; cupule small, the narrow acute parts nearly separate.

Panama, Costa Rica.

PANAMÁ: headwaters of Río Chinilla above Nuevo Limón, *Maxon 6903* (det. Burret).

9. *GEONOMA FERRUGINEA* Wendl. ex Spruce in *Jour. Linn. Soc. Bot.* 11:110.

1871; Burret, in *Engler's Bot. Jahrb.* 63:227. 1930.

Slender tree, with graceful arching pinnate very strongly veined leaves that are more or less brownish from minute pubescence or furfur; petiole 30–50 cm. long, flattish on under surface, ridged on upper face, more or less pubescent or thinly furfuraceous; blade 75 cm.–1 m. long, irregularly pinnate; pinnae well separated, many pairs but not definitely opposite, 30–40 cm. long, attached by broad bases, terminal pair 4–8 cm. broad, some of the others as narrow as 1 cm., conspicuously parallel-nerved with many light-colored ribs that stand 5–7 cm.

apart, apex narrowly long-acuminate: spathe-valves narrow, broad and essentially obtuse at end, brown-pubescent; spadix 18–30 cm. across either way at full expansion, brown-pubescent, rachillae simple from different sides of the rachis or sometimes once-forked, 8–12 cm. long, lower lip of alveole 2-fid but soon falling from some of the pits: fruit (immature) oblong, 8 mm. long but probably becoming 12 mm. or more long, surface roughened, cupule of narrow-lobed parts.

Panama, Costa Rica.

CHIRIQUÍ: rain forest, Bajo Chorro, Boquete District, Davidson 377.

Burret, in describing the plant from old collections in the Turrialba region of Costa Rica, says that this palm is 3–4 m. high; Davidson records it as 30–40 feet.

10. *GEONOMA BINERVIA* Oerst. in Kjoeb. Vidensk. Meddel. 1858:33. 1859.

Tree to 5 m. tall, trunk 4 cm. thick, strongly ringed: leaves unequally pinnate, blade to 2 m. long, petiole 30–60 cm. long; pinnae about 25 pairs, not uniform in width, glabrous or sometimes lightly scurfy on main veins, 50–60 cm. long, narrower ones not much more than 1 cm. broad, others 7 or 8 cm. and terminal pair as much as 12 cm. or even more, all strongly parallel-veined, apex extended into narrow tails, obliquely attached and not narrowed on rachis: spadix compound and much branching, the long flattened peduncle subtended at base by 2 conspicuous up-standing ear-like strongly ribbed spathe-valves 15–20 cm. long; flowering and fruiting cluster 60–75 m. long, hanging, diffuse, the lightly pubescent maroon-colored rachillae 20–30 cm. long and 2–3 mm. thick, in which the minute purplish flowers are imbedded; staminate flowers about 4 mm. long, whitish, usually somewhat exserted at anthesis, filaments projected beyond the staminal tube, the 2 separated anther-cells pointed backward; pistillate flowers smaller, 3 stigmas exserted, staminodial tube pronounced: fruit globular-oblong, 4–6 mm. long, somewhat contracted toward base, glabrous, brown-black at maturity.



Fig. 66. *Geonoma binervia*

Panama, woods, often overlooked in underbrush, probably widely spread; Mexico to Costa Rica.

CANAL ZONE: Barro Colorado Island, Bailey 76; Canal Zone Forest Preserve, Allen 2539; Río Pequín, Madden Lake area, Fairchild & Jobbins 2637; drowned forest of Quebrada Culebra, Steyermark 17220. PANAMÁ: Pedro Gonzales, Perlas Islands, Panama Bay, Allen 2605. BOCAS DEL TORO: Water Valley, von Wedel 975.

22. *ASTEROGYNE* Wendl.

ASTEROGYNE Wendl. ex Benth. & Hook. Gen. Pl. 3:914. 1883.

Small monoecious palms with simple somewhat lobed narrow leaves distin-



Fig. 67. *Asterogyne Martiana*

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guished from *Geonoma* by the separate or discrete anthers pendulous from the top of the free part of the filament, disk adnate to the base of the corolla, style terminal, fruit ellipsoid; rachillae few, simple, placed finger-like at or near top of peduncle.

Species 2, Central America to Colombia.

1. *ASTEROGYNE MARTIANA* Wendl. ex Burret, in Engler's Bot. Jahrb. 63:140. 1930.

Geonoma Martiana Wendl. in Linnaea 28:342. 1856.

Shrub to 2 or 2.5 m. tall, erect, with thin costate foliage: leaf-blades simple and deeply bilobed or irregularly split-pinnate, 50–60 cm. long, 15–20 cm. broad, glabrous on upper face, somewhat brown-scurfy on rachis and ribs underneath, with many prominent nerves 5–6 mm. apart and 2 or 3 thinner ones between; pinnae (when the blade is divided) perhaps reduced to shreds as narrow as 1 cm., apices long-acuminate; petiole about 50 cm. long, very slender, furrowed or concave on under surface, ridged on upper surface, glabrous or perhaps temporarily scurfy: spadix a terminal almost umbelliform cluster of 4–6 finger-like straight or curved colored rachillae 10–12 cm. long and each bearing a nude spike at the end 1–1.5 cm. long; peduncle about 40 cm. long, erect, covered to one-half or more its length with 2 striate spathe-sheaths and very small bracts higher up; axis of rachilla 4–5 mm. thick at anthesis, closely pubescent, the flowers prominently projecting from the narrow alveoles; lower lip of alveole entire or only lightly emarginate, not reflexing; floral parts conspicuous at anthesis, the filament tube evident and the discrete anther-cells pendent in an inverted V-form from the top of the filament.

BOCAS DEL TORO: Water Valley, von Wedel 952; vicinity of Chiriquí Lagoon, von Wedel 1108, 2186.

Prominently distinguished by the narrow spiniform tip of the finger-like rachillae. This species was based originally on plants cultivated in Germany from Central America. It is reported from Nicaragua (as *Geonoma trifurcata* Oerst.), Costa Rica, Colombia, but not heretofore from Panama, the *Asteroogyne* formerly assigned to Barro Colorado Island being *Geonoma decurrens*.

23. *IRIARTEA* Ruiz & Pav.

IRIARTEA Ruiz & Pav. Fl. Peruv. & Chil. Prodr. 149. 1794.

Tall erect slender unarmed monoecious pinnate-leaved palms with conspicuous brace-roots, notable crownshaft and often with bulged trunk: pinnae irregular, often split so that several of them appear to stand together on the rachis, usually broadened towards the apex and variously lobed or notched or erose at summit: spadices infrafoliar, below the prominent crownshaft, inclosed at first in papery cymbas: flowers typically in 3's on the simple rachillae (which are side-branches from the axis of the spadix), central flower pistillate and the laterals staminate but

this disposition may not apply uniformly and a rachilla may be pistillate mostly on its lower part and staminate on the upper part; stamens usually fewer than 20, about equal in length to the broad envelopes, anthers long and filaments very short; pistillate flowers smaller than staminate; ovary 3-loculed, stigmas small, staminodia sometimes present: fruit subglobular, oblong or ovoid, 1- to 2-seeded; albumen homogeneous, embryo lateral or dorsal.

About a half dozen species in South America, one of them reaching eastern Panama. *Iriartea* and *Socratea* are distinguished mainly by technical characters: *Iriartea*, spathes many, stamens commonly less than 20 and as few as 9 or 10, embryo dorsal or lateral; *Socratea*, spathes cymba-like, stamens commonly more than 20, usually 25-35, embryo subapical.

1. *IRIARTEA CORNETO* (Karst.) Wendl. in Bonplandia 8:102. 1860.

Deckeria Corneto Karst. Fl. Columb. 107. 1856.

Very tall palm overtopping the forest, reported as much as 60 m., trunk about 30 cm. diameter, often tumid at middle, obscurely ringed, brace-roots many and conspicuous: leaves about a dozen, forming a compact high head or coma, the irregular cuneate pinnae about 20 pairs and split or parted into several parts 1 m. long and 13-15 cm. broad, some of them narrower, erose at summit: spadices hanging, with short rachillae issuing from the rachis; staminate flowers mostly twin on upper part of rachilla, pistillates solitary at base of rachilla or single between 2 staminates; stamens 16-20, pistillode missing; petals valvate; pistillate flowers with imbricate or convolute petals, 3-loculed ovary: fruit depressed-globose, 5 cm. thick, somewhat succulent, yellowish-orange; seed solitary.

DARIÉN: in mixed hardwoods, in hills chiefly, between 4000 and 5000 feet altitude.

Described originally from humid forests in the Andes of Bogota, and known eastward on the llanos. The Darién occurrence needs further study. Called *Corneto*.

24. *SOCRATEA* Karst.

SOCRATEA Karst. in Linnaea 28:263. 1856.

Erect tall pinnate-leaved monoecious palms with strong brace-roots near the base of the obscurely ringed trunk, unarmed except that the brace-roots may bear spinous processes, the pinnae unequal in size and shape and variously erose or notched or jagged at apex, crownshaft prominent and more or less bulged at apex of bole and underneath the canopy of leaf-blades: spadices infraxillary, once-branched, eventually drooping or hanging; cymbas 2, thin and papery when dry, the spadix itself usually bractless; pistillate flowers either near the base of the rachilla or the length of it among the staminate flowers, normally 1 between 2 staminates; stamens many, about equalling the valvate petals, sepals very small, pistillode minute or none; pistillate flowers with imbricate small sepals; staminodia lacking; ovary 3-loculed: fruit drupe-like but with firm or hard exterior, ellipsoid

or obovoid or oblong, size of small plum, 1- to 2-seeded; albumen equable, embryo subapical.

Eight or ten species, South American and one of them extending northward to Nicaragua.

1. *SOCRATEA DURISSIMA* (Oerst.) Wendl. in Bonplandia 8:103. 1860.

Iriartea durissima Oerst. in Kjoeb. Vidensk. Meddel. 1858:30. 1859.

Slender forest tree to 25 or 30 m., often swaying or leaning but essentially an erect palm, trunk irregularly but prominently ringed, petioles deciduous: leaf-blade to 2 m. long, with many irregular rather narrow pinnae and a pair of very broad terminal ones, glabrous except perhaps furfuraceous on under surface near base; pinnae 40-60 cm. long, variable in width from 4 to 20 cm., broader toward apex and irregularly notched at end and perhaps along the side, terminal ones sometimes nearly truncate, all very strongly several-nerved: cymbas 40-50 cm. long, not sulcate, deciduous; staminate flowers 10-12 mm. long; sepals obtuse; petals broad-ovate, large; stamens about 35, nearly as long as petals, anthers long and filaments very short; pistillate flowers smaller than staminate, sepals and petals imbricate, pistil 3-loculed: fruit oblong, 2.5-3 cm. long, obtuse but with short oblique point, becoming dull brown; seed single, with very hard white albumen.

Frequent tree in Canal Zone; probably widely distributed in Panama. Sometimes the brace-roots are many and as high as a man, and the main trunk may nearly disappear close to the ground. Known as *Stilt Palm*, *Jira*.

CANAL ZONE: Barro Colorado Island, Bailey 74. COLÓN: Quebrada Lopez, slopes of Cerro Santa Rita, Allen 2942.

Identification of this palm is not positive. *S. durissima* was described from the San Juan River region in Nicaragua without flowers or fruits. When good collections are made in that territory the relationship to the Panama tree can be determined.

25. MALORTIEA Wendl.

MALORTIEA Wendl. in Berliner Allgem. Gartenzeit. 21:25, 145. 1853; Hook. f. in Benth. & Hook. Gen. Pl. 3:906. 1883.

Small often nearly or quite acaulescent spineless glabrous monoecious palms with unequally or imperfectly pinnate or pinnatisect dentate leaves or the blade sometimes simple and lobed, parts broadest toward the top and not attenuate-pointed: spadices interfoliar, consisting of 2-4 very short rachillae that bear both staminate and pistillate flowers in the axil of a short bract or lip; stamens 9 or more, within angled striate floral envelopes; ovary more or less 3-loculed; staminodia usually present: fruit oblong or ellipsoid, small, not fleshy, obtuse or umbonate, 1-seeded; albumen plain, flinty.

About a half dozen species in forests and shady moist places, Mexico to Panama; generic limits not yet well understood.

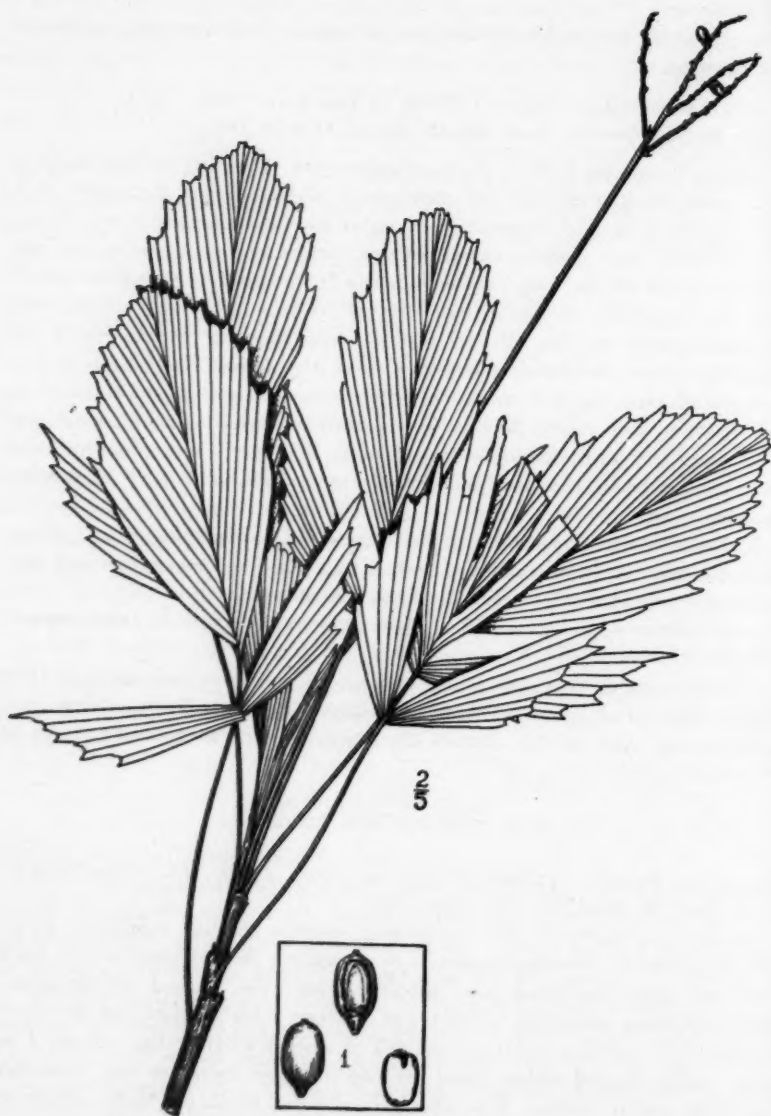


Fig. 68. *Malortia simplex*

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1. *MALORTIEA SIMPLEX* Wendl. in Bot. Zeit. 17:5. 1859.

Reinhardtia simplex Burret, in Notizbl. Bot. Gart. u. Mus. Berlin 11:554. 1932.

Erect, 1 m. or less tall, often only 50 cm., sometimes reported much larger, with few erect lobed or irregularly pinnate or pinnatisect leaves, the blade 15–25 cm. long and 9–10 cm. broad, central lobe or part much larger than the 2–4 very narrow lower divisions and oblong or cuneate-oblong in outline, margins incised or strongly dentate or both, midrib prominent and lateral ascending veins issuing from it; petiole thin, flattened: peduncle from lower axils near the ground, 15–30 cm. long, flattened, rachilla at the top 4–7 cm. long: fruit oblong, 12–14 mm. long, about 6 mm. wide, black, blunt or short-acute.

Panama; originally described from Costa Rica.

BOCAS DEL TORO: Water Valley and Chiriquí Lagoon, von Wedel 611, 923, 1002, 1592. DARIÉN: forests around Pinogana, southern Darién, Pittier 6539. "Rubber station in western Panama," Stork 116.

26. *RAPHIA* Beauv.

RAPHIA Beauv. Fl. Oware et Benin 1:75. 1804.

Monococious unarmed pinnate-leaved heavy trees, often soboliferous or growing in clumps in moist or wet places, monocarpic (plant dying after fruiting): spadices immense in size, interfoliar; the great branches pendent or hanging, 2 m. and more long, thicker than a man's arm, the ultimate stiff or even rigid distichous rachillae 6–10 cm. long and very closely flowered, the long staminate flowers conspicuously imbedded, stamens 6 and more with erect linear anthers; pistillate flowers larger or at least broader than the staminate, ovoid, the closed body or involucre covered with retrorse scales, staminodia present inside, ovary 3-loculed, stigma sessile; trusses or "hands" of flowers and fruits projecting from beneath hard parchment-like sheathing imbricate scales or spathes that immutably involve the rachis: fruit a loricate oblong or pyriform body 4–6 cm. long, containing within the shell a single oblong nut-like seed ornamented with rapheal lines and depressions and ruminant inside with prominent intrusions.

About 20 species in tropical Africa, and several varieties; the only Old World genus of palms native also in the western hemisphere, represented on the continent by apparently a single species; another species on Martinique, French West Indies, is perhaps introduced.

1. *RAPHIA TAEDIGERA* Mart. Hist. Nat. Palm. 3:216. 1838.

Sagus taedigera Mart. op. cit. 2:54. 1824.

Raphia vinifera var. *taedigera* Drude, in Mart. Fl. Bras. 3³:287. 1882.

Raphia vinifera Auth., non Beauv.

Soboliferous, making a mass of great ascending and arching leaves and trunks arising from the mass 8–9 m. or more and as much as 30 cm. thick, sending up slender breathing-roots or shoots a few cm. above the mold or the water: leaves uniformly pinnate, 12–14 m. long; petiole 15–20 cm. thick near its base, convex

on under surface and concave on upper face, woody; pinnae numerous and close together, subopposite, 1-1.5 m. or more long, 4-5 cm. broad, midrib prominent and elevated with strong secondary veins either side, apex long-pointed but not very narrow, margins bearing thin forward-pointing spicules: flowers in clusters protruding in distichous hands or clusters from the tight spathes or sheaths, at fruiting time the spent stamiferous fingers conspicuous among and beyond the fruits and spathes: fruit short-oblong with nearly square or truncate ends and short beak, 5-7 cm. long and 3-4 cm. thick, completely covered by smooth brown imbricate lorics or scales with scarious margins and indistinct median line; inside the loriculate shell another integument incloses an oblong hard wrinkled nutlet or seed about 3 cm. long, the albumen coarsely ruminate.

CANAL ZONE: Mohinga Swamp, lower Chagres River, Bailey 578. BOCAS DEL TORO: near Almirante, A. F. Skutch.

Called *Pine-cone Palm*. Probably generally distributed along the Atlantic seaboard; supposed to be the same species as that in the estuary region of the Amazon, whence the species *taedigera* was first described; there are indications that it grows near Puerto Limón in Costa Rica. Material is not available for determination of *R. nicaraguensis* Oerst., of Nicaragua; Beccari thinks it to be the African *R. Ruffia* Mart.

27. MANICARIA Gaertn.

MANICARIA Gaertn. Fruct. et Semin. Pl. 2:468. 1791.

Vigorous medium-sized monoecious unarmed trees with pinnately veined large leaves that are variously indented and pinnatisect or even pinnate, inflorescence interfoliar, trunk roughly ringed: spadix 1 m. long more or less, inclosed in a papery closed woven bag that tears open irregularly lengthwise to free the densely flowered rachillae; staminate flowers occupying upper part of rachilla somewhat sunken in it and attended by subulate bracts, stamens many (commonly 27) with linear erect anthers; pistillate flowers mostly near base of rachilla, somewhat immersed, 3-loculed and 3-ovuled, one or more of the ovules developing, staminodia perhaps a dozen: fruit an echinate or tubercled hard large cortex, a nearly globular ball when one ovule develops but often 2- to 3-lobed; seed globular, reticulated with rapheal branches, embryo basal, albumen plane.

Three species in farther West Indies, Central America, South America.

1. MANICARIA SACCIFERA Gaertn. op. cit. 469. 1791.

Tree to 10 m., usually growing in colonies, trunks to 30 cm. diameter and two of them often coalesced at base and commonly inclined or leaning, with aerial roots at base: leaves inclined and finally lopped or hanging, to 10 m. long and 2 m. broad, the blade nearly entire to rather completely but very irregularly pinnate, texture coriaceous, glabrous; pinnae or segments 2 cm. or much more broad with strong midrib and indifferent parallel veins, 1 m. more or less long, not much narrowed and obliquely attached at base; petiole 1 m. or more long, soft and

light, not woody: spadix a simple continuing axis, the rachillae simple and 25-30 cm. long: fruit when simple or 1-seeded essentially globular but somewhat tapered to base, 4-5 cm. diameter, when twin or triplet 7-8 cm. the long way, brown when dry, completely covered with angular tubercles.

Wet places, as on or near shores and in swamps, Atlantic side of Panama, often in dense groves, probably widely distributed in the Republic; the one growing in Central America and southern West Indies is apparently this species. The hard durable nuts often are carried long distances by sea, the rough exterior perhaps perishing on the way and only the polished interior shell externally remaining. Called *Monkey-cap Palm*, because from the brown sleeve or cloth-like spathe caps are made which are sold on the streets of Colón.

CANAL ZONE: swamps near Fort Sherman, Bay of Limón, *Bailey 214*.

28. PHYTELEPHAS Ruiz & Pav. "Ivory-nut Palm"

PHYTELEPHAS Ruiz & Pav. Syst. Veg. 299. 1798.

Elephantusia Willd. Sp. Pl. 4:1156. 1805.

Dioecious pinnate-leaved mostly heavy palms with trunks inclined or more or less creeping at first and bearing roots, spadices infrapetiole, borne near or at the surface of the ground, fragrant in bloom, frequently in colonies and often almost to the exclusion of other vegetation, sometimes in clumps or "islas," staminate tree usually larger and more robust: leaves very long, ascending-arching with many alternate and subopposite long narrow pinnae: staminate spadix a long compactly flowered simple and often recurved catkin with its short peduncle inclosed in 2 cymba-like spathe-valves above which there may be pointed bracts on the peduncle, the individual flowers with a simple toothed perianth and many stamens bearing anthers mostly shorter than the filaments; pistillate spadix a head or heads of several flowers at the summit of a stout peduncle with 3 or 4 spathes, bearing a few long flowers with many slender staminodes about the 6- to 9-loculed prominent ovary from the center of which arises an extended style with 6-9 spreading or recurved stigmas at its apex; floral envelopes imbricate, sepals 3, petals 6 or more, and a few long white or whitish bracts exceeding the petals; each locule of the ovary containing a single erect ovule attached to a central intrusion or placenta: fruit a flattened tuberculate body 12 cm. and more across and 7-10 cm. high containing within the brittle shell as many nutlets as there were locules in the ovary, the place of the styles in the center of the head being covered by large inflexed tubercle-like points; nutlets hard and heavy, wedge-shaped with thin edge toward the center and the back obtuse or rounded, surface covered with loose fibers; seed inside the firm shell of the nutlet, of its same general conformation, sometimes covered with rapheal ridges and markings but in other species smooth, embryo at the lower inner angle or corner near the hilum imbedded in very hard continuous ivory-like white plane albumen. (Morphologies subject to modification as new studies develop.)



Fig. 69. *Phylephas Serranuii*

(298)

Panama to Peru in damp places in valleys of streams, coastal areas and sometimes on mountains of 1000 m.; species perhaps a half dozen but not well understood, and accurate definitions yet impossible because of lack of type and authentic specimens. There appears to be much variation in the period at which the trunk assumes an upright direction and in the height it eventually attains, as well also as in the size and shape of the seeds. At first the interior of the seed is liquid or of a jelly-like consistency, but it eventually becomes exceedingly dense and hard and the albumen is used in industry as "vegetable ivory" for the making of buttons, cane-heads and other small articles and the seeds are an article of exportation from their native regions. The great heads with angular spines and tubercles, often weighing several pounds, are striking-looking objects, earth-brown, glabrous, the processes usually strongly striate.

1. PHYTELEPHAS SEEMANNII Cook, in U. S. Dept. Agr., Bur. Plant Ind. Bull. 242:68. 1912; Jour. Washington Acad. Sci. 17:226. 1927.

Phytelephas macrocarpa Seem. Bot. Voy. Herald, 205. 1852; not Ruiz & Pav., as to the Panama plant.

Trunk at first decumbent or creeping, at length rising under favorable conditions and age, becoming 40 cm. or more thick and perhaps 8 m. tall, bearing at one time about 20 living leaves; bases of the petioles persistent on the short trunk and accumulating dirt and refuse among which the great fruits may rest: leaves 2 m. and more long, mostly rising from near the ground; petiole trough-like, deeply concave on front, keeled on back, not hard-woody; pinnae 100 and more, 5-6 cm. apart on the ridged rachis or more remote on the lower part of the blade, central ones about 1 m. long and 3-5 cm. broad, with pronounced midrib and strong side-ribs, conspicuously irregularly cross-veined particularly underneath, tending to split lengthwise: staminate spadix often 1 m. or more long, sometimes much less: fruiting clusters usually 2-5 in number, each cluster comprising 3-8 depressed fruits or heads on a short stout peduncle and armored like an alligator's hide, the clusters at maturity often lying on the ground or in the mold caught in the leaf-bases; nutlets 9 or fewer in each fruit, about 7 cm. high, 6 cm. broad, 3-4 cm. thick at the rounded back, inner side (against its neighbor) flat, becoming coal-black, involved in coarse fibers, free inside the carpellary tubercled shell; seed free inside the hard but rather thin integument, semi-lunate, about 5 cm. high and 4 cm. broad, ridged and ornamented with rapheal subsidiaries, albumen ivory-like and white.

Apparently widely distributed in Panama but its range elsewhere, if any, not determined.

COLÓN: slopes of Cerro Santa Rita, *Allen 2941*. DARIÉN: "banks of rivers of Southern Darién, forming extensive groves by itself," as stated by Seemann.

Seemann writes that in December, 1847, "whilst ascending the river Cupica, I had the good fortune to fall in with the Ivory plant, and afterwards met with it in various other parts of Darién." Cook states that "the original locality of Seemann's palm at Cupica is not in Panama territory."

It is probable that the names *P. brachelus*, *brachinus*, *brevipes*, *cornutus*, *Pittieri* O. F. Cook, 1913, come within *P. Seemannii* as here defined, and they are not at present separately treated; the collections were made at Garachiné, San Miguel Bay, near the south coast of Panama; Gasapasabana, Upper Mamoni River; Río Fató Valley, near Nombre de Dios; Puerto Obaldía. The descriptions are not sufficient and specimens of mature fruits are not in the National Herbarium, although photographs of some of them are available.

CYCLANTHACEAE

Perennial shrubs or suffrutescent herbs of Palm-like habit, acaulescent or with more or less extensive, frequently clambering stems, terrestrial or epiphytic. Leaves spiral or distichous, 2-cleft or flabellate, rarely entire. Inflorescence a spadix of small monoecious flowers, subtended by 2 to several conspicuous foliaceous or petalaceous spathes. Staminate and pistillate flowers alternating spirally or arranged in alternate cycles. Staminate flowers: perianth 0 or cupulate and several-toothed; stamens numerous, anthers 2-celled, longitudinally dehiscent. Pistillate flowers: 2- to 4-carpellate, separate or mutually concrescent; perianth 0 or of 4 perigonial lobes; staminodes 4-6, filamentous and usually very long and filamentous; ovary superior to inferior, 1-locular, bearing numerous anatropous ovules upon 2-4 parietal placentae, stigmas 1-4. Fruit a fleshy syncarp of distinct or united berries, frequently shed from the spadix in concrescent sheets of fleshy pulp.

- a. Staminate and pistillate flowers alternating spirally, the staminate in clusters of 4, the pistillate solitary; plants not laticiferous. 1. CARLUDOVICA
 aa. Staminate and pistillate flowers arranged in separate, alternating cycles, the pistillate of each cycle strongly concrescent; plants laticiferous. 2. CYCLANTHUS

1. CARLUDOVICA R. & P.

CARLUDOVICA R. & P. Fl. Peruv. Prodr. 136. pl. 37. 1797.

Ludovia Pers. Syn. 2:576. 1807.

Salmia Willd. Ges. Naturf. Fr. Berlin, Mag. 5:399. 1811.

Ludovia Brongn. Ann. Sci. Nat. XV, 4:361. 1861, non Pers.

Evodianthus Oerst. Kjoeb. Vidensk. Meddel. 194. 1875.

Sarcinanthus Oerst. loc. cit. 196. 1875.

Steleostylis Drude, in Mart. Fl. Bras. 3²:230. 1881.

Plants acaulescent or with more or less extensive, erect or clambering stems, terrestrial or epiphytic. Leaves spiral or distichous, 2-cleft or divided into 3 to many flabellate divisions, rarely entire. Spadix subtended by 2 to several green or white spathes. Staminate and pistillate flowers alternating spirally, the staminate in clusters of 4, the pistillate solitary. Staminate flowers with many-toothed, cupulate perianth, caducous or marcescent. Pistillate flowers separate or mutually sunken in the fleshy spadix axis, with 4 equal or subequal, free or basally united, more or less conspicuous perigonial lobes; stigmas 4, sessile or with a short style. Berries produced separately or in concrescent sheets of fleshy tissue.

The various segregate genera of *Carludovica* are based for the most part upon rather obscure characters of the staminate flowers such as a plane or concave surface of the receptacle, distribution of the stamens, texture and even coloration of the staminal filaments, and attachment of the pedicel. Since these criteria are so infrequently or so poorly observable in the rather meager herbarium material available at present, and in view of the obviously close relationship of the plants, "it seems better to keep them all in *Carludovica* as sections, where they are just as valuable or more so in our present lack of knowledge" [Gleason, Bull. Torrey Club 56:2. 1929].

The *Carludovicas* include over 30 recognizable species of tropical America, both continental and Antillean, where they form a conspicuous element of the rain forest vegetation from sea level to altitudes of over 2500 m.

- a. Leaves entire, or but slightly crenulate toward the subcaudate tip..... 1. *C. INTEGRIFOLIA*
- aa. Leaves deeply bifid or flabellate.
 - b. Leaf blade much longer than broad, deeply bifid, or irregularly lacerate in age.
 - c. Spathes congested immediately below the spadix; fruiting flowers nearly separate.
 - d. Spadices oblongoid or cylindrical; anthers exserted.
 - e. Plants large and coarse, usually with rather stout, clambering stems; fruiting spadices about 2.0-2.5 cm. long..... 2. *C. UTILIS*
 - ee. Plants small and slender, acaulescent or nearly so; fruiting spadices about 1 cm. long..... 3. *C. MICROCEPHALA*
 - dd. Spadices globose, about 2 cm. in diameter; anthers included; plants of moderate size, with relatively slender, clambering stems..... 4. *C. OERSTEDII*
 - cc. Spathes more distant, extending along about the upper half, or the entire length of the peduncle; fruiting flowers more or less immersed within the fleshy spadix axis.
 - d. Leaf segments broadly ovate or ovate-trigonal, abruptly acute to very shortly acuminate; spadices globose..... 5. *C. PITTIERI*
 - dd. Leaf segments lanceolate to linear-lanceolate, gradually acuminate; spadices oblongoid to cylindrical.
 - e. Spathes persistent in fruit; plants relatively slender, the stems clambering, the leaf sheaths about half encircling the stem..... 6. *C. MICROPHYLLA*
 - ee. Spathes deciduous; plants stout, the leaf sheaths encircling the stem.
 - f. Spadices 2-3 times as long as broad, much thicker than the peduncle; primary nerves of leaves relatively close (0.3-0.6 cm.).
 - g. Plants acaulescent or with short stout stems; fruiting spadices 1-3 cm. broad; spathes borne along the upper half of the peduncle; stigmas with short but obvious styles..... 7. *C. ENSIFORMIS*
 - gg. Plants with extensive clambering stems; fruiting spadices 4-5 cm. broad; spathes borne along the whole length of the peduncle; stigmas sessile..... 8. *C. SARMENTOSA*
 - ff. Spadices 5-8 times as long as broad, scarcely thicker than the peduncle; primary nerves of leaves relatively distant (1.0-2.5 cm.)..... 9. *C. KILLIPII*
 - bb. Leaf blade as broad as long, usually deeply divided into 3-5 wedge-shaped segments, these in turn subdivided into numerous acuminate, flabellate sectors.
 - c. Fruiting perigonal lobes scarcely laminate, about as long as the stigmas or somewhat shorter..... 10. *C. PALMATA*
 - cc. Fruiting perigonal lobes distinctly laminate, much longer than the stigmas.

d. Fruiting perigonal lobes very narrowly lanceolate-trigonal, 0.7–0.8 cm. long. 11. *C. DRAUDEI*

dd. Fruiting perigonal lobes broadly oblong-trigonal, 2.5–3.0 cm. long. 12. *C. ROTUNDIFOLIA*

1. *CARLUDOVICA INTEGRIFOLIA* Woods. in Woodson & Schery, Ann. Missouri Bot. Gard. 29:322. 1942.

Plants apparently rather graceful and clambering. Leaves rather long-petiolate, membranaceous, entire, broadly elliptic-oblongate, broadly acute and slightly crenulate toward the tip, apex narrowly and abruptly subcaudate-acuminate, the base acute, gradually tapered from about the upper third, 22–30 cm. long, 4–6 cm. broad; petioles rather slender, 12–15 cm. long, vaginate for the lower third. Peduncles 5–6 cm. long, rather slender. Spadix (in immature fruit) fusiform-cylindric, about 2.0–2.5 cm. long, about 0.4 cm. thick; pistillate flowers small, sessile, perigonal lobes very shallow, scarcely manifest. Spathes deciduous, apparently 5, borne along the upper half of the peduncle.

Panama.

DARIÉN: Río Sambú, above tide level, Pittier 5560.

Another entire-leaved *Carludovica* was collected by P. C. Standley in the garden of C. W. Powell at Balboa, C. Z., in 1925. The specimen (U. S. Nat. Herb. no. 1252076) consists of a single leaf of the same general outline as those of *C. integrifolia* but much larger (about 50 cm. long, 12 cm. broad), and is accompanied by the following remarks: "Said to be from the nearby woods. Acaulescent. Leaves all simple." No similar plants have been encountered in the Canal Zone since that time, and the cultivated plant apparently was lost before the Missouri Botanical Garden acquired Mr. Powell's collection in 1926.

2. *CARLUDOVICA UTILIS* (Oerst.) Benth. & Hook. ex Hemsl. Biol. Centr.-Am. Bot. 3:416. 1885.

Sarcinanthus utilis Oerst. Vid. Medd. Kjoeb. 197. 1857.

Plants stout, usually clambering; stems 1.5–2.5 cm. thick. Leaves long-petiolate; blades 50–70 cm. long, bifid for about $\frac{2}{3}$ their length, the segments narrowly lanceolate, gradually acuminate, 3–5 cm. broad; petioles 40–60 cm. long, relatively stout and clasping at the base. Peduncles relatively slender, about 10 cm. long in flower, increasing to about 20 cm. in fruit; spathes congested immediately subtending the spadix, 4–6, ovate-lanceolate, acuminate, 5–7 cm. long, deciduous; spadix oblongoid, 2.0–2.5 cm. long, about 0.8 cm. thick.

British Honduras to Panama; possibly extending to Colombia.

CANAL ZONE: Quebrada Ancha, Steyermark & Allen s.n.; Quebrada Salamanca, Dodge, Steyermark & Allen 17005; Quebrada Bonita, Dodge & Allen 17075. DARIÉN: Cana-Cuasi Trail, Chepigana Distr., Terry & Terry 1466.

Popular names in Costa Rica applied to this plant are reported by Standley as *Coligallo*, *Cola de gallo*, *Tucuso*, *Palma*, and *Chidra*. The dried and blanched leaves have been employed locally in the manufacture of hats, and the stems of this and other species of the genus are used like willow stems in the building of furniture and baskets.

3. *CARLUDOVICA MICROCEPHALA* Hook. f. Bot. Mag. pl. 7263. 1892.

Plants slender, acaulescent or nearly so; stems about 0.7 cm. thick. Leaves fairly long-petiolate; blades 15–20 cm. long, bifid for about $\frac{2}{3}$ their length, the segments ensiform, narrowly acuminate, 2.0–2.5 cm. broad; petioles 14–18 cm. long, slender. Peduncles very slender, 3.5–4.0 cm. long in flower, increasing to 10 cm. in fruit; spathes 2, congested immediately below the spadix, ovate, narrowly acuminate, 2.5 cm. long, pale green; spadix oblongoid, about 1 cm. long, 0.5 cm. thick.

Greater Antilles; Honduras to Panama, in lowland forests.

BOCAS DEL TORO: Isla Colón, von Wedel 1259; Water Valley, von Wedel 921; hills above Fish Creek, von Wedel 2188.

4. *CARLUDOVICA OERSTEDII* Hemsl. Biol. Centr.-Am. Bot. 3:416. 1885.

Evodianthus angustifolius Oerst. Vid. Medd. Kjoeb. 195. 1857, non *C. angustifolia* R. & P.

Plants of moderate size; stems clambering, rather slender, about 1 cm. thick. Leaves rather shortly petiolate; blades 45–50 cm. long, bifid for about $\frac{2}{3}$ their length, the segments linear-ensiform, very narrowly acuminate, 1.5–2.5 cm. broad; petioles 12–15 cm. long. Peduncles 7–9 cm. long in fruit; spathes 2–3, congested immediately below the spadix, deciduous; spadix globose, about 2 cm. in fruit.

Honduras to Panama, in lowland forests.

BOCAS DEL TORO: Isla Colón, Woodson, Allen & Seibert 1943; von Wedel 479, 2975, 281; Water Valley, von Wedel 824. SAN BLAS: Plain of Sperdi, near Puerto Obaldia, Pittier 4352.

Popular names in Costa Rica, according to Standley, are *Coligallo*, *Chirrivaca*, and *Chidra*. Oersted reported that Indians had been seen to eat the ripe spadices.

5. *CARLUDOVICA PITTIERI* Woods. in Woodson & Schery, Ann. Missouri Bot. Gard. 29:323. 1942.

Plants of moderate size, acaulescent or nearly so. Leaves long-petiolate; blades about 28 cm. long and 15 cm. broad, bifid for only about $\frac{1}{4}$ their length, the segments 7 cm. broad, broadly acute to very shortly acuminate; petioles relatively slender, 19 cm. long. Peduncle 5 cm. long in fruit, bearing 2 distinct spathe-nodes at about the middle; spathes deciduous; fruiting spadix globose, 2.0–2.5 cm. in diameter.

Panama, in foothill forests.

SAN BLAS: high hills back of Puerto Obaldia, Pittier 4312.

6. *CARLUDOVICA MICROPHYLLA* Oerst. Vid. Medd. Kjoeb. 197. 1857.

Carludovica stenophylla Standl. Fl. Costa Rica 3:130. 1937.

Plants relatively slender; stems extensive and clambering, about 0.5 cm. thick. Leaves rather shortly petiolate; blades 20–60 cm. long, bifid for about $\frac{2}{3}$ their length, the segments rather broadly ensiform, narrowly acuminate, about 2 cm. broad; petioles 8–35 cm. long, very slender, the base about half encircling the stem. Peduncles 9–10 cm. long in flower and fruit; spathes 6–8, persistent, borne



Fig. 70
Carludovica microphylla

the entire length of the peduncle, ovate to ovate-lanceolate, acute to acuminate, 5-8 cm. long, pale greenish; spadix broadly oblongoid, 3.5-4.0 cm. long, 1.5-2.0 cm. thick.

Costa Rica and Panama, in highland forest.

CHIRIQUÍ: Bajo Chorro, Davidson 34, 376; Río Chiriquí Viejo valley, G. White 75; Bajo Mona and Quebrada Chiquero, Woodson & Schery 567; Bambito to Cerro Punta, Allen 306.

Very frequent in mountain forests of the Cordillera de Talamanca. The outstanding characteristic of this species is the persistent spathes, by which it may be instantly recognized.

7. *CARLUDOVICA ENSIFORMIS* Hook. f. Bot. Mag. pl. 6418. 1879.

Carludovica irazuensis Cuf. Archivo Bot. 9:4. 1933.

Plants acaulescent or with a rather short, stout stem. Leaves with long or relatively short petioles; blades 30-70 cm. long, bifid for about $\frac{3}{4}$ their length, the segments ensiform, gradually acuminate, 2-6 cm. broad; petioles relatively stout, 15-50 cm. long, broadly sheathing at the base. Peduncles 8-17 cm. long in fruit; spathes numerous, caducous, borne along about the upper half of the peduncle; fruiting spadix oblongoid, 3-9 cm. long, 1-3 cm. thick; fruiting perigonal lobes broadly ovate-trigonal, about equalling the pistils; stigmas with short but manifest styles.

Costa Rica and Panama, in highland forests.

CHIRIQUÍ: Cuesta de Las Palmas, Cerro de la Horqueta, Pittier 3240; Volcán de Chiriquí, Woodson, Allen & Seibert 878; Bajo Chorro, Woodson & Schery 625; Davidson 35; Cerro Copete, Woodson & Schery 373; Cerro Punta to headwaters of Río Caldera, Allen 1460. COCLÉ: El Valle de Antón, Woodson & Schery 192.

8. *CARLUDOVICA SARMENTOSA* Sagot ex Drude, in Mart. Fl. Bras. 3²:239. pl. 58. 1881.

Plants stout; stems extensive and clambering, 1.0-2.5 cm. thick. Leaves very shortly petiolate; blades 20-30 cm. long, bifid for about $\frac{3}{4}$ their length, the segments about 2 cm. broad, narrowly acuminate; petioles relatively slender, 7-9 cm. long. Fruit peduncles about 10 cm. long, very stout; spathes numerous, caducous, borne the whole length of the peduncle; fruiting spadices very broadly oblongoid or ovoid, 7-8 cm. long, 4-5 cm. thick; fruiting flowers very large,

about 1.0–1.5 cm. broad, the perigonal lobes broadly deltoid, about equalling the pistils, the stigmas sessile.

Panama, Colombia, and the Guianas, in highland forests.

DARIÉN: Cana and vicinity, *Williams* 798.

Perhaps the outstanding *Carludovica* of Panama with bifid leaves, because of the liana-like stems and lustrous fruiting spadices with unusually large pistillate flowers.

9. *CARLUDOVICA KILLIPH* Standl. Field Mus. Publ. Bot. 22:65. 1940.

Plants stout. Leaves long-petiolate, coriaceous; blades 60–100 cm. long, bifid for about $\frac{2}{3}$ their length, the segments 8.5–12.0 cm. broad, shortly acuminate; petioles stout, 55 cm. long with a bifid vagina 30 cm. long. Peduncles 30 cm. long, 0.5–0.7 cm. thick; spathes 8–10, caducous, borne along about the upper half of the peduncle; fruiting spadix cylindrical, 5–8 cm. long and 1.0–1.5 cm. thick, the flowers small, about 0.35 cm. broad, the stigmas sessile.

Panama and northwestern Colombia, in lowland forests.

DARIÉN: Cerro de Garagará, Sambú basin, *Pittier* 5658.

10. *CARLUDOVICA PALMATA* R. & P. Syst. 291. 1798.

Carludovica incisa Wendl. Ind. Palm. 67. 1854.

Carludovica gigantea O. Ktze. Rev. Gen. 2:737. 1891.



Fig. 71
Carludovica palmata

Plants stout, acaulescent. Leaves long-petiolate; blade broadly flabellate, divided into 3–5 wedge-shaped segments, each in turn subdivided into numerous acuminate sectors, about 40–80 cm. broad and long; petioles relatively slender, about 1–2 m. long. Peduncles slender, about 20–45 cm. long; spathes usually 4, congested immediately below the spadix, 30–50 cm. long, the outer green, frequently with foliaceous, palmate appendages, the inner creamy white and petalaceous; spadix narrowly cylindrical, 10–12 cm. long, about 1 cm. thick; fruiting perigonal lobes deltoid-trigonal, 1.0–1.5 mm. long, about as long as the pistils.

Southern Mexico to Peru, in lowland forests.

BOCAS DEL TORO: Isla Colón, *von Wedel* 1208, 2806; Río Cricamola, *Woodson, Allen & Seibert* 1921. CANAL ZONE: Matachín, *Kuntze s. n.*; Las Cruces Trail, *Hunter & Allen* 454.

The Panama Hat Palm is one of the abundant plants of the lowland forests of Panama. The young leaves of this species provide the fibre from which the so-called "Panama hats" are made, although the industry actually is restricted to

Ecuador. Popular names in Panama are *Palmilla*, *Palmita*, *Jipijaps*, *Portorrico*, and *Atadero*.

11. *CARLUDOVICA DRUDEI* Mast. Gard. Chron. 2:714. 1877.

Plants stout, acaulescent. Leaves long-petiolate; blade broadly flabellate, divided into 3 wedge-shaped segments, each in turn subdivided into numerous acuminate sectors, about 1 m. broad and long; petioles rather slender, 1.5–2.0 m. long. Peduncles stout, 40–50 cm. long; spathes 4, congested immediately below the spadix; spadix narrowly cylindrical, 11–12 cm. long, 1.5 cm. thick; fruiting perigonial lobes very narrowly lance-trigonal, acuminate, 7–8 mm. long, somewhat foliaceous, far surpassing the pistil.

Panama and Colombia, in lowland forests.

CHIRIQUÍ: Puerto Armuelles, Woodson & Schery 910.

12. *CARLUDOVICA ROTUNDIFOLIA* Wendl. ex Hook. f. Bot. Mag. pl. 7083. 1889.

Plants stout, acaulescent. Leaves long-petiolate; blade broadly flabellate, divided into 3 wedge-shaped segments, each in turn subdivided into numerous acuminate segments, 0.8–1.5 m. broad and long; petioles 1.5–2.0 m. long. Peduncles about 0.5 m. long; spathes 4, congested immediately below the spadix, the outer pair green, tipped with a small digitate blade 15–25 cm. long, the inner pair white, petalaceous; spadix broadly cylindrical, 9–10 cm. long, 3.0–3.5 cm. thick; fruiting perigonial lobes broadly oblong-trigonal, 2.5–3.0 cm. long, much surpassing the pistils, somewhat foliaceous and spreading.

Costa Rica and Panama, in highland forests.

CHIRIQUÍ: Bajo Chorro, Woodson & Schery 675; Volcán de Chiriquí, Quebrada Velo, Woodson & Schery 248.

2. *CYCLANTHUS* Poit.

CYCLANTHUS Poit. Mém. Mus. Paris 9:35. 1822.

Cyclosanthes Poeppig, Froriep. Notiz. 31:312. 1831.

Discanthus Spruce, Jour. Linn. Soc. Bot. 3:196. 1859.

Plants acaulescent, terrestrial, lactescent. Leaves spiral, deeply 2-cleft, resembling those of many species of *Carludovica*. Spadix immediately subtended by 5–7 petalaceous or somewhat foliaceous spathes. Staminate and pistillate flowers arranged in separate, alternating cycles, those of each cycle adnate and more or less completely confluent; staminate flowers naked; pistillate flowers enclosed by 2 rims of fleshy tissue representing the concrescent perianths, staminodia numerous, short. Fruit a syncarp consisting of the various fleshy cycles of pistillate flowers, somewhat resembling a large screw.

Two or three species of tropical America.

1. *CYCLANTHUS BIPARTITUS* Poit. Mém. Mus. Paris 9:35. 1822.*Dicranthus odoratus* Spruce, Jour. Linn. Soc. Bot. 3:196. 1859.

Fig. 72
Cyclanthus bipartitus

Plants fairly stout, acaulescent, frequently forming colonies. Leaves long-petiolate; blade 50–100 cm. long, almost completely bifid, the segments ensiform, narrowly acuminate, 7–15 cm. broad; petioles 35–80 cm. long. Peduncles 40–90 cm. long; spathes broadly ovate, the inner cream-color, the outer somewhat foliaceous; spadix cylindrical, 5–8 cm. long, 1.5–2.5 cm. broad.

Guatemala to Peru, Trinidad, and northeastern Brazil, frequent in lowland forests.

BOCAS DEL TORO: Bocas del Toro, *Carleton* 56. CANAL ZONE: Río Indio, *Maxon* 4863; Las Cascadas, *Standley* 25725; Fort Randolph, *Maxon & Harvey* 6511; Quebrada Bonita, *Steyermark & Allen* 17209. CHIRIQUÍ: San Bartolomé, *Woodson & Schery* 895. COCLÉ: El Valle de Antón, *Allen* 1809. COLÓN: Porto Bello, *Christopherson* 402. DARIÉN: Cana, *Goldman* 1895.

The popular name is reported as *Portorrico*.

